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TQL in the Department of the Navy's Operating Forces and Shore Establishment: Does it Differ?

by

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Captain, United States Marine Corps
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Submitted in partial fulfillment
of the requirements for the degree of

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from the

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December, 1992

ABSTRACT

This thesis makes available to DON TQL educators and practitioners data gathered about differences between DON operating force and shore establishment organizations in the conduct of TQL. A survey was conducted to assess what TQL tools and processes were used by the two organization types, and statistical testing was used to determine how the organizations differed in the use of TQL tools and processes.

The results of the statistical testing indicate that although there were some significant differences found when the compared organization types had less than one year of TQL exposure, the compared organizations with at least one year of TQL exposure were generally similar in their conduct of TQL.

Components of an Open Systems model of organizations: "culture", "behavior and processes", "inputs", and "purposes" were used to explain the differences in TQL conduct by the two organization types, and form the basis for recommendations on how to reduce differences between them.

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I. INTRODUCTION

This chapter begins with a discussion of the CNO's efforts to introduce "total quality" principles into the DON. The origins of "Total Quality Management/Total Quality Leadership" are also examined, as well as the interface between Total Quality Leadership (TQL) and Open Systems Theory. The analysis then reviews the basic questions that are being asked by DON members about the applicability of TQL to the DON environment, and is followed by a presentation of the thesis objectives and research questions. The chapter concludes with an outline of the organization of this study.

A. BACKGROUND

1. Admiral Kelso's Vision

On 13 August 1990, Admiral Kelso, Chief of Naval Operations, issued a memorandum to all flag officers indicating his intentions to implement Total Quality Leadership (TQL) throughout the Department of the Navy. TQL was to be the Department of the Navy's (DON) version of Total Quality Management (TQM), a management philosophy that had been used in America's private industry for nearly a decade. In outlining his decision to implement TQL throughout the Navy, Admiral Kelso wrote:

> I want us to structure a quietly effective effort to improve quality in the Navy which makes sense to our people, helps them get the job done properly, and helps us all manage our resources better...I want to continue that initiative ashore and expand it to include the operating forces. [Ref. 1:p.1]

After the introduction of TQM in the Navy's shore establishment (two major examples being efforts at DON facilities at MCAS Cherry Point [Ref. 2:pp. 147-184] and Norfolk Naval Shipyard [Ref. 3:pp. 1-14]), the Navy could now focus its efforts towards implementing TQL in the operating forces, with emphasis on "the need to identify, analyze, improve and redesign the individual processes of our operations in order to improve and redesign the product." [Ref. 1:p. 1]

In the time since the publication of Admiral Kelso's memorandum, the DON has undertaken concrete steps to implement TQL in the operating forces. Navy and Marine Corps senior leaders have attended seminars, mapped out strategic plans based on TQL, and are currently sending subordinate leaders to schools at Naval Amphibious School Little Creek and Naval Amphibious School Coronado. Additionally, TQL "mobile training teams" have been formed on both coasts to assist the operating forces in implementing TQL. The desired outcome of these efforts, Admiral Kelso writes, will be "to achieve and maintain the superiority of the Navy product and improve it continuously." [Ref. 1:p. 2]

2. The TQM/TQL Interface

Why would a military organization decide to implement a management philosophy that was almost unheard of in the United States as recently as 1980? To understand the reason for the Navy's efforts, a review of the philosophy's origin and its successful employment in the civilian and public sectors is necessary.

The origins of TQL are found in Dr. W. A. Shewhart's Statistical Quality Control (SQC) work [Ref. 4:p. 14]. Dr. Shewhart studied variation while working as a statistician at Bell Laboratories in the 1920s. Shewhart determined that random variation in a worker's tasks had defined limits, and by setting acceptable highs and lows for the variable under analysis, points outside of those limits could be determined [Ref. 5:p. 15]. The causes for these external points could then be studied to eliminate them.

A young colleague of Dr. Shewhart, Dr. W. E. Deming, studied his findings, and they became the basis for his life's work. Dr. Deming was in part responsible for the first use of statistical sampling by the census bureau in 1940, and he also found wide applications for statistical control methods in clerical and industrial operations. Dr. Deming taught 23 SQC seminars around the U.S. in the 1940s. In all, over 31,000 students were taught SQC during that period. SQC began to fall out of favor in the ensuing post-war years because the increased demand for consumer goods in America signaled a

return for managers to Frederick Winslow Taylor's "Scientific Management" practices, where mechanization of tasks and control of end-product was stressed. Quantity became more important than quality, and by 1949, statistical quality control techniques were virtually ignored by American industry. [Ref. 6:pp. 7-9]

At the request of the Union of Japanese Scientists and Engineers (JUSE), Dr. Deming travelled to Japan in 1950 and taught SQC to managers and engineers [Ref. 4:p.17]. He returned to Japan to teach throughout the 1950s, and Japanese industries used SQC methods to build their post-war industrial base [Ref. 6:p. 13-14]. Reinforced by Dr. J. M. Juran's visits to Japan in the mid-1950s (where he stressed SQC as a management concern [Ref. 4:p. 19]), SQC played a major role in Japan's capture of world markets and its economic influence today.

The United States re-discovered Dr. Deming in 1980, when his work was featured in an NBC-TV documentary [Ref. 7:p. 113]. In the last 10 years, the use of his methods has spread throughout the private sector in major companies such as Ford Motor, AT&T, Campbell Soup and General Motors. Additionally, the Department of Defense used Dr. Deming's teachings in 1987 to develop the Total Quality Management (TQM) program [Ref. 7:p. 274], and the Office of Management and Budget established the Federal Quality Institute to act as a quality center for government agencies [Ref. 7:p. 277].

DoD's quality efforts were preceded by total quality initiatives in the DON shore establishment, and quality efforts have made inroads into other U.S. armed forces [Ref. 8:pp. 21-25]. DON is playing a major role in the movement by implementing total quality principles across the entire naval establishment, and striving for what Admiral Kelso called "continuous improvements in processes to produce continuously improving results" [Ref. 1:p. 2].

3. TQL/Open Systems Theory Interface

The move towards TQL in the Navy is a major undertaking. As Dr. Deming wrote, "We will have to undergo total demolition of American style of management, which unfortunately has spread to just about the whole western world" [Ref. 6:p. 59]. By choosing to take this course, DON is attempting to shift the focus of management (usually defined in the Navy as "leadership") from the control of outputs to the continuous improvement of processes. Just as American management thinking in the Cold War era was characterized by an emphasis on outputs rather than continuous improvement, the armed forces have focused their efforts on performing missions at an acceptable cost and controlling costs through inspection of the final product. As subsequent chapters will reveal, TQL changes the focus from outputs to the processes that create the outputs, and addresses the entire range of organizational existence, including elements

such as environment, purposes, culture, behavior and processes, to name a few.

The TQL philosophy's view of organizations, then, is compatible with the theoretical view of "open systems". For example, TQL philosophy recognizes that organizations must concern themselves with both customers and suppliers, as they are both external to the organization, yet are inextricably tied to the organization's missions, efforts and performance. Open Systems theory discusses the importation of energy from the "outside" as being essential to an organization's survival, and recognizes that organizations have "throughput" (raw material that is processed) and "output" that is returned to the customer or consumer. Another feature of open systems is that the organization must import more "energy" than it expends, or else it moves towards disorganization or "death". TQL philosophy recognizes that the organization must seek the continuous improvement of processes, which places the organization in a position to "capture the market", thus allowing it to stay in business. The link between TQL and Open Systems theory will be discussed in greater detail in Chapter II, but as the two preceding examples already show, the TQL philosophy shares compatible views with Open Systems theory on the dynamic forces that affect organizations.

4. Acceptance of TQL in DON

While the Navy is directing its new efforts at spreading the TQL philosophy in the operating forces, the initiative is being questioned in some unofficial DON circles. This initial resistance to TQL is caused by basic questions about the philosophy's applicability to the operating force's environment. Skepticism centers around the belief that a management style or philosophy that enjoys great success in the civilian sector may be of little or no value in a combat environment, where traditional leadership principles take over. [Ref. 9:pp. 19-21] For example, one of the basic tenets of TQL is found in Dr. Deming's "14 Points of Management" (which will be discussed in greater detail in Chapter II). Point 7 states: "Teach and institute leadership". One Marine officer argues that:

> The small unit leader knows that the success of his unit depends almost entirely upon his personal leadership and the leadership of his subordinate unit members...American management may currently be made up of supervisors, but the successful unit commander has always been a leader. [Ref. 9:p. 20]

Another point of resistance is directed against Point 3, which states "Understand the purpose of inspection, for improvement of processes and reduction of cost." The same officer writes,

> Of course, the small unit leader will use the sampling techniques described by the TQM philosophy to monitor his unit's progress, but he knows that no amount of mass inspection will make the improperly trained or poorly motivated unit polished and successful. Therefore, this principle is nothing new to the military leader. [Ref.

9:p. 20]

Another point of contention in the DON operating forces against the TQL philosophy is that the already-high and ever-increasing operational tempo of the fleet does not allow for the detailed introspection needed to examine unit processes towards improving the quality of the unit's efforts. Putting it another way, there remains in DON a general perception that "combat" usually necessitates a "waste" of resources because there are too many unexpected contingencies that arise. A generalization can be made that this institutional attitude has been around as an opposing thought since former Secretary of Defense McNamara's PPBS (Planning, Programming and Budgeting System), which organized resource allocations within DOD in an effort to control spending. This perception of "waste" as a necessary evil creates a barrier to acceptance of TQL because it rejects the need for process control that leads to long-term cost reduction in the DOD, or DON for that matter.

While documented research on the DON's general attitude towards TQL is still sparse, one study conducted sheds light on how DON servicemembers may resist the TQL philosophy. The study, conducted with Marine officers and staff non-commissioned officers found general acceptance of TQL by the entire group, but specific features of TQL met resistance by specific sub-groups. For instance, TQL involves the use of quantitative methods (as will be described in

Chapter II). The study found that officers display solid resistance to the use of quantitative TQL tools when faced with the idea of using them. [Ref. 10:p. 76] The study also found that Staff Sergeants showed resistance to de-emphasizing individual performance and unit inspections [Ref. 10:p. 80]. The TQL philosophy, in contrast, calls for an assessment of performance that focuses on noting individual performances that are above or below statistically determined control limits, and working to improve the performance of all personnel that fall within the established control limits.

Attitudes, opinions and perceptions about TQL, then, seem to differ greatly within DON. While the senior DON leadership is educating itself and its junior members on "total quality" principles, stated attitudes and documented research show that the education process is just beginning. Since TQL is still in its early stages of implementation in the Navy, one can expect that greater exposure to it will lead to a greater acceptance of its principles.

The "acid test" of TQL acceptance will come in the form of how TQL is implemented over time. The actual practice of TQL is likely to vary from organization to organization. Organizations will be in varying stages of the TQL implementation process, adopting TQL practices in a manner that fits their particular "open system" (which will be covered in greater detail in Chapter II), and achieving results that can be traced to a number of variables that are

an inherent part of all organizations.

As the following section will show, this thesis is an attempt to understand what is currently happening in the DON's TQL implementation process by documenting the practice of TQL in the DON's operating force and shore establishment organization, and by comparing the two organization types to assess differences in how they implement Total Quality Leadership.

B. OBJECTIVES AND RESEARCH QUESTIONS

1. The Objective

This study's central question is: Does TQL differ in the operating forces and shore establishment? The objective of this thesis is to determine if there is a significant difference in the conduct of TQL in each type of organization.

This study will broaden the DON's understanding of how TQL is conducted in its organizations, and will be useful to educators and planners of TQL in that the results may influence future instruction and implementation decisions within the DON. The study will also highlight particular areas of TQL that may be of greater or lesser importance to particular organization types. Additionally, it will broaden Navy members' knowledge of TQL in DON organizations.

2. Research Questions

The following research questions will be addressed:

a. Primary Research Question

Is there significant difference in the way the DON operating forces and shore establishment conduct TQL?

b. Secondary Research Question

- Do TQL processes differ significantly between the DON operating forces and shore establishment?
- Do TQL tools differ significantly between the DON operating forces and shore establishment?

3. Scope, Limitations and Assumptions

a. Scope

This thesis focuses on the differences, if any, in DON operating force and shore establishment application of the TQL philosophy. This study does not focus on the relative merit of any particular organization's application, nor does it make judgements on the inclusion, or lack of inclusion, of any particular total quality practice. Rather, this study seeks to highlight the differences that may exist in the conduct of TQL in both types of organizations, and it attempts to explain why those differences may exist.

b. Limitations

The data used in this thesis was acquired through the survey method. The survey was limited in part by the small number of operating force organizations that have been exposed to TQL. Their limited exposure requires qualifications on the strength of the study's conclusions.

Also, most operating force units surveyed had been exposed to TQL for a limited amount of time. This further restricted the population size of the survey. Additionally, some organizations that were queried declined to participate in the study, citing that they were not "far enough along" to provide data for the survey.

c. Assumptions

This thesis assumes the reader has limited knowledge of total quality concepts and of the DON's TQL efforts to date. Chapter II provides a review of management and total quality concepts to aid the reader in understanding the methodology and research instrument for this thesis.

4. Organization of Study

Chapter I provides an overview of the current TQL efforts in DON, and introduces the direction of this thesis. Chapter II is a review of organization theory, emphasizing the open systems models of assessment. This chapter also covers the concept of total quality as it is currently being introduced in the Navy and develops the link between Open System theory and TQL. Chapter III discusses the survey instrument and the statistical methods used to analyze the survey data. Chapter IV presents the data collected and analyzes and interprets it. Chapter V develops a conclusion on the results of the thesis and makes recommendations on

them. The thesis concludes with appendices, bibliography and a list of references.

II. LITERATURE REVIEW/THEORETICAL FRAMEWORK

Before an analysis of the differences between the practice of TQL in operating force and shore establishment can be made, and before the differences can be examined using Open Systems theory as the framework for analysis, the reader must understand the basis tenets of TQL and Open Systems theory, which will be covered in this chapter's first two sections. This chapter will also develop the idea that Total Quality Leadership principles are closely allied to Open Systems theory. The commonality between TQL and Open System theory is important for the reader to understand because Open System organization models are a useful tool for assessing the dynamics of organizations that are undergoing a transformation to TQL principles or that are already operating in a "total quality" environment.

The opening section of this chapter introduces the reader to the Open Systems theory of organizations. Following an analysis of the theory's roots, Open Systems theory is described. The explanation of the theory is followed by a description of an open systems model for organizational assessment. The model is displayed and is followed by a listing of ideas related to the model that need to be included in organizational diagnosis. The model provides the basis for

analysis of the survey findings in Chapter IV.

Section B. of this chapter reviews "total quality" and TQL. The major parts of the DON TQL philosophy are reviewed, with emphasis on Dr. Deming's "System of Profound Knowledge" and "14 Points of Management", the latter which serves as the basis for the survey instrument used to answer the thesis research questions.

Section C. of this chapter develops the connection between Open Systems theory and Total Quality Leadership, which allows the reader to understand the research methodology used in this thesis and the basis for the explanations and recommendations on the research findings.

A. ORGANIZATIONS AS OPEN SYSTEMS

1. Roots

The origins of Open Systems theory are found in the works of social-psychological theorists. According to authors Katz and Kahn [Ref. 11:p. 9], there are four past conceptualizations that have led to the current interest in the systems view of organizations. Marxian theory emphasized the social relations of production in privately-owned uncontrolled industry, and the resulting class conflict. Structural Functionalists have focused on social stability, and the adjustments made within society to stay functional and preserve that stability. Event-Structure Theory envisions social structures as a cycle of events which return in

circular fashion to reinstate the cycle. General Systems Theory, developed by biologist Ludwig von Bertalanffy, emphasized the similarities in conceptualizations that can be made using various academic disciplines, and also postulates the openness of every system.

Von Bertalanffy also argued that systems varied in their complexity and variability, and he confined his studies to emphasizing what systems are composed of. [Ref. 12:p. 101]

2. Description of Open Systems

Open Systems Theory has taken the General Systems view a step further by emphasizing the dynamic interaction of input, throughput, and output. According to Katz & Kahn, open systems have ten distinguishing characteristics: [Ref. 13:pp. 70-73]

a. Importation of energy

The human organization must draw energy from the outside to ensure its survival. Energy can take many forms: financial, technical, human, political, among others. For example, the U. S. Navy must rely on the research and development efforts of the private sector to field a technologically competitive naval force. Without an ongoing and fruitful research and development effort in the private sector, the Navy would not enjoy the technological advantage that it has over the rest of the world's navies today.

b. Throughput

Organizations acquire raw materials, process them, and return them to the customer or consumer. This idea is not limited to manufacturing organizations, as any organization has a form of throughput. The U. S. Marine Corps acquires recruits as raw material, and processes them into trained infantry. In turn, these Marines provide a defense service for the taxpayer.

c. Output

Organizations perform an output function. The output of the armed services is open to wide interpretation, but usually includes a number of concepts: defense, combat power, contingency forces, etc.

d. Systems as a cycle of events

This idea relates to Event-Structure theory. It is the belief that events rather than things provide an organization with its identity, and that social structures (the chain of events between and among people) establish boundaries. For example, U.S. Marine units that were surrounded by communist Chinese forces during the U.S. forces fighting withdrawal from the upper Korean peninsula in 1950 were often composed of the remnants of decimated units. The chain of events forced these Marines to reconstitute and fight their way back to friendly territory as newly-formed units. For the time that these units banded together to consolidate

their resources and efforts, they established an identity and a boundary between themselves and the environment, and they acted as an organization.

e. Negative Entropy

The view of General System theory is that it is a required law of nature that all organizations move towards disorganization or death. According to Katz and Kahn, by importing more energy from its environment than it expends, the open system can store energy, thus acquiring "negative entropy". Negative entropy acts as a buffer for the organization between itself and the state of decomposition. If, for example, an organization "corners the market" on a resource, it is further shielded from circumstances that could adversely affect it. In effect, the organization has moved a step away from disorganization or "death". Thus, the organization is said to have acquired negative entropy.

f. Information input, negative feedback, and the coding process

Organizations must obtain feedback on how well their output is being received, so that they may take corrective action if necessary. All potential feedback goes through an organizational coding process, as organizational members try to simplify all the feedback or possibilities into fundamental categories that seem most relevant for a given system. For example, a military recruiting district report

may determine that the failure to enlist a certain category of individual was caused by limited recruiter resources, poor military career possibilities for that individual type, or even on a lack of individuals in that category within the district. The causes will be derived from the categories that the recruiting department feels are valid for that system.

g. Steady-state and dynamic homeostasis

According to Katz and Kahn:

> steady state is not a motionless or true equilibrium. There is continuous inflow of energy from the external environment and a continuous export of the products of the system, but the character of the system, the ratio of the energy exchanges and the relations between parts, remains the same.[Ref. 19:p. 26]

The authors also write that:

> dynamic homeostasis is based on the principles of Le Chatelier (See Bradley and Calvin, 1956), who maintain that any internal or external factor that threatens to disrupt the system is countered by forces which restore the system as closely as possible to its previous state. [Ref. 19: p. 27]

h. Differentiation

As an organization continues to grow, specialization and division of labor evolve. For example, the armed services found a need for trained computer operators when it acquired computer technology. As a result, the armed services now have their own computer operators.

i. Integration and Coordination

Katz and Kahn write that integration and coordination serve as a stabilizing influence for the effects

of differentiation: their presence holds the organization in balance. Integration is achieved through shared norms and values, while coordination is achieved through priority setting, the establishment and regulation of routines, timing and synchronization of functions, and the scheduling and sequence of events. [Ref. 11:p. 30]

j. Equifinality

Open systems reach the same final state from differing initial conditions and by a variety of paths. However, as open systems move toward regulatory mechanisms to control their operations, the amount of equifinality may be reduced. For example, the U.S. Army and U.S. Marine Corps, on a superficial level, share many of the same roles. Yet, their organization and development as fighting forces have taken clearly separate paths. Their move towards the same final state may be prevented in part by the regulatory mechanisms that control their operations, such as mission statements.

3. The Open Systems Model

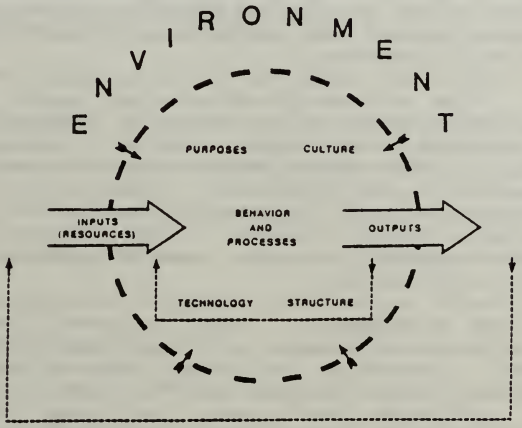
As theorists have developed conceptualizations about organizations, researchers have used these theoretical frameworks to study actual organizations.[1]

Researchers have developed models that enable them to "picture" the dynamic forces at work within the organization's

---

[1]For a more detailed review of the major approaches to studying organizations through Open Systems theory, see Ref. 13, Chapter 2.

sphere. The models include the major components of open systems, and vary in level of detail. The models are used by Organizational Development (OD) practitioners to study organizations. M.I. Harrison's Open System model (1987) is a useful tool for organizational assessment, and is used for assessment in this thesis. Figure 1 is a depiction of the model: [Ref. 14:p. 24]



NOTE: Dotted lines show feedback loops.

Figure 1
Harrison's Model of
Organizations as Open Systems

What follows is a description of the model and its key sub-components [Ref. 14:p. 23-25]:

Inputs (or resources) - This includes the raw materials, money, people ("human resources"), information, and knowledge that an organization obtains from its environment and that contribute to the creation of its outputs.

Outputs - This includes the products, services, and ideas that are the outcomes of organizational action. An

organization transfers its main outputs back to the environment and uses others internally.

Technology - This includes the methods and processes for transforming resources into outputs. These methods may be mental, as well as physical and mechanical.

Environment - The **Task Environment** includes all the external organization and conditions that are directly related to an organizations main operations and its technologies. The **General Environment** includes institutions and conditions that may have infrequent or long-term impacts on the organization and its task environment, including the economy, the legal system, the state of scientific and technical knowledge, social institutions, population distribution and composition, the political system, and the national culture within which the organization operates.

Purposes - This includes the strategies, goals, objectives, plans and interests of the organization's dominant decision makers. **Strategies** are overall routes to goals, **goals** are desired end states, whereas **objectives** are specific targets and indicators of goal attainment. **Plans** specify courses of action toward some end. Purposes may be explicit or implicit in the decision maker's actions. They are the outcomes of conflict and negotiation among powerful parties within and outside the organization.

Behavior and processes - This includes the prevailing patterns of behavior, interactions, and relationships between groups and individuals, including cooperation, conflict, coordination, communications, controlling and rewarding behavior, influence and power relations, supervision, leadership, decision making, problem solving, planning, goal setting, information gathering, self-criticism, evaluation, and group learning.

Culture - This includes shared norms, beliefs, values, symbols, and rituals relating to key aspects of organizational life, such as the nature and identity of the organization, the way work is done, the value and possibility of changing or innovating, and relationships between lower and higher ranking members.

Structure - This includes enduring relations between individuals, groups, and larger units - including role assignments (job descriptions; authority, responsibility, privileges attached to positions); grouping of positions in departments or units; standard operating procedures; established mechanisms for handling key processes such as coordination (e.g., committees, weekly meetings); human

resource mechanisms (career lines, reward, evaluation procedures); actual patterns (e.g., informal relations, cliques, coalitions, power distribution) that may differ from officially mandated ones.

According to Harrison, the model contains several important ideas that must be incorporated into any organizational diagnosis: [Ref. 14:p. 25-27]

1. External conditions influence the flow of inputs (resources) to organizations, affect the reception of outputs, and can directly affect internal operations.

For instance, when budget cuts force a redistribution of resources within the armed services, decisions are made as to what defense programs will lose funding. The redistribution of resources changes the shape and performance capabilities of the military and have an effect on how missions are accomplished. Figure 1 shows the possibility for direct impacts on internal operations by showing a broken, permeable boundary around the organization. Feedback from outputs to inputs occurs when customer responses to products or services affect resource flows. For example, if the American public, the military's customer, want a decrease in military spending, it will affect the financial resources available to the armed services.

2. Organizations use many of their products, services and ideas as inputs to organizational maintenance or growth (as shown in Figure 1 by feedback loop within the organizational boundary).

An example of this would be the generation of new ideas that are acquired through battlefield experiences. The ideas are regenerated as new doctrine, and the knowledge

becomes an organizational resource.

3. Organizations are influenced by their members as well as their environment.

Organizations, therefore, are affected internally. Members of an organization may contribute to its operations, resist them, or change them from within. For example, the changing social mores of the American public can affect what occurs in the military. Generational attitude changes have led to a de-glamorization of alcohol and tobacco use in the military, partly because military members reflect the civilian society to which they once belonged.

4. The eight system elements and their subcomponents are interrelated and influence one another.

For example, an organization's culture and structure affect members' behavior, but their behavior also shapes the structure and the culture. Thus, while a philosophy such as TQL can have an effect on members' behavior, the members will have an effect on the practice of TQL in that organization.

5. Organizations are constantly changing as relationships among their system elements shift.

If, for example, TQL is introduced into an organization, the philosophy will affect behavior and processes in that organization, which may in turn affect other system elements.

6. An organization's success depends heavily on the ability to adapt to its environment, or to find a favorable environment in which to operate - as well as its ability to tie people into their roles in the organization, conduct its transformative processes, and run its operations (Katz & Kahn, 1978)

For example, a prime concern of DON is to monitor its strengths and weaknesses, and to determine where it can best support the DoD mission. The U.S. Navy must also concern itself with the management of personnel and operations. Furthermore, the Navy must adapt to its environment by constantly monitoring it. Monitoring takes many forms: from assessing the political winds of Capitol Hill to conducting external assessments of enemy and friendly force capabilities.

7. Any level or unit within an organization can be viewed as a system.

A squad of infantry can be viewed as a system. It incorporates all of the key sub-components of the Open System model, and it can be assessed using the sub-components as criteria. Additionally, the division to which the squad belongs to can also be viewed as a system. The open systems model allows for assessment at any level.

The seven ideas introduced above are important for understanding that the model in Figure 1 is dynamic and lends itself to a broad diagnosis of the organization. Through an analysis of the elements of this model, conclusions can be drawn about the organization. The Open Systems model, therefore, is an outstanding diagnostic tool for organizational assessment.

Section D. of this chapter examines the link between the Open Systems Theory and TQL and explains how the Open System model can be used to assess the differences in the

conduct of TQL among DON shore establishment and operating force organizations.

To help the reader with understanding the link, however, the next section will examine the philosophy of TQL.

B. TOTAL QUALITY/TOTAL QUALITY LEADERSHIP

1. Introduction

The DON defines Total Quality as "the application of quantitative methods and people to assess and improve materials and services supplied to the organization, all significant processes within the organization, and meeting the needs of the customer, now and in the future."

The Total Quality effort, in its most desired form, should cause a chain reaction: quality improvements lead to decreased costs because of less rework, fewer mistakes, fewer delays, and better use of resources. This leads to productivity improvements, which enables the organization to "capture the market" with better quality and lower price. The end result: the organization stays in business and provides more jobs. [Ref. 5:p. 166] While the above description of total quality gives the concept a decided industrial/manufacturing orientation, the most important idea is the view that quality initiatives will lead to decreased costs and increased productivity. This situation is desired by any organization with limited resources, including the U.S. Navy.

The DON has decided to call its total quality effort "Total Quality Leadership", in obvious reference to the traditional role of leadership in the Navy [Ref. 1:p. 1]. While the words "total quality" and "TQL" can often be used to discuss the same ideas or notions, for purposes of this thesis ideas that form the basis of "total quality" thought will be referred to as such, while concepts of quality developed by the Navy will be referred to as TQL.

The remainder of this chapter will examine Dr. Deming's "System of Profound Knowledge" and "14 Points of Management", and will develop the theoretical framework for use of Deming's teachings as quality assessment criteria. While this review is not intended to be a complete analysis of Dr. Deming's teachings, it does cover the major topics of his work, and it should prove useful to the reader's understanding of the basic elements of TQL. Familiarity with these ideas will allow the reader to understand the connection between TQL and Open Systems theory and why the survey was developed in its particular form.

2. Deming's System of Profound Knowledge

Dr. Deming bases his teachings on what he calls the System of Profound Knowledge. This system consists of four major areas of study: systems theory, statistical theory, psychology of individuals and society/learning and change, and theory of knowledge. [Ref. 5:p. 150]

a. Systems Theory

Dr. Deming defines a system as "a series of functions or activities within an organization that work together for the aim of the organization" [Ref. 5:p. 151]. He also states that "management of a system" requires "knowledge of the interrelationships between all the sub-processes within the system and of everybody that works in it", and that "the performance of any component sub-process is to be evaluated in terms of its contribution to the aim of the system, not for its individual production or profit" [Ref. 5p. 151]. Dr. Deming believes that the role of management is to optimize the system [Ref. 5:p. 152]. Furthermore, he believes it is the role of management to create a system that stresses continuous improvement, rather than merely the prevention of defects.[2]

b. Statistical Theory

Much of what Dr. Deming has written in this area forms the heart of his argument against conventional management practices. At the root of his beliefs is the view that a system consists of processes, and that to improve the system, management must improve the processes. To understand how to improve processes, however, Dr. Deming states that managers and workers must have "some knowledge

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[2]For a detailed analysis of Dr. Deming's ideas on "Continuous Improvement", see Ref. 17, Chapter 4.

of variation" [Ref. 5:p. 153].

Deming's views on variation are closely allied with the work done by his early colleague, Dr. Shewhart, over 60 years ago. Shewhart developed the idea that variation in a process or system has two types of causes: **common causes**, which are inherently a part of the process or system, and **special causes**, which are not a part of the process or system, but which come about due to special circumstances. [Ref. 15:p. 71]

A process or system that has only common causes affecting the outcome is called a stable process, which implies that the variation in the outcomes is predictable within statistically established limits. A process whose outcomes are affected by both common causes and special causes is called an unstable process. It is called unstable because the magnitude of variation from one time period to the next is unpredictable. [Ref. 15:p. 71]

Shewhart also determined that the method to determine whether variation in a process is dominated by common or special causes is a control chart.[3] Deming became one of Shewhart's proponents on the use of control charts, and has used them throughout his career. He also used control charts to prove how "tampering" was harmful to

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[3]For a detailed review of Shewhart's control charts, see Ref. 5, Chapter 3.

keeping a process stable.[4] According to Deming:

> Action taken on a stable system in response to variation within the control limits, in an effort to compensate for this variation, is tampering, the results of which will inevitably increase the variation and increase costs from here on out. This advice holds even if the system is producing faulty items. A faulty item is not a signal of a special cause. [Ref. 16:p. 65]

According to Deming, the act of tampering is a feature of one of the two types of mistakes most often made by managers. The first is treating as a special cause any fault, complaint, mistake, breakdown, accident or shortage that actually comes from a common cause. The second type of mistake occurs when a fault, complaint, mistake, breakdown, accident or shortage is attributed to a common cause when it actually came from a special cause. [Ref. 5:p. 154]

Since management is responsible for the organization's systems, its important role is to take responsibility for action on common causes: improving the system. The responsibility for action on special causes falls to the worker, who is in a better position to remove the special cause and allow the system to remain stable. If a stable system suddenly becomes unstable, it is likely to be due to a special cause. If individuals treat that special cause as a common cause and make fundamental changes to that system, they are tampering, the net effect of which

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[4]For a complete review of the effects of tampering on a system, see Ref. 16.

is to make the system even less stable. For example, a decision by a maintenance officer to replace a part on every radio in a communications unit because one radio had a defective part is not effective, unless the officer has already determined that the problem is related to all the similar parts, and not just the defective part originally discovered. If the problem is actually related to only one part, the maintenance technician or radio operator is in a position to make the decision to replace the part for that component, and the maintenance officer should concern himself with determining why a certain percentage of parts may be bad (if the problem does in fact exist). All too often, Deming argues, managers spend their time fixing special causes of variation and ignoring their duty to work on improving the overall system. [Ref. 17:p. 83]

c. Psychology in the System of Profound Knowledge

Dr. Deming explains the role of psychology in his System of Profound Knowledge in the following manner:

> Intrinsic motivation is a person's innate dignity and self-esteem; his natural esteem for other people. One is born with a natural inclination to learn and to be innovative. One inherits a right to enjoy his work. Psychology helps us to nurture and preserve these positive attributes of people.
>
> Extrinsic motivation is submission to external forces that neutralize intrinsic motivation. Pay is not a motivator. Under extrinsic motivation, learning and joy in learning in school are submerged in order to capture top grades. On the job, joy in work, and innovation, becomes secondary to a good rating. Under extrinsic motivation, one is ruled by external forces. He tries

> to protect what he has. He strives for a high rating, or for a high grade in school. He tries to avoid punishment. He knows no joy in work. He knows no joy in learning. Extrinsic motivation is a **zero-defect mentality**. [Ref. 5:p. 157] (Emphasis added)

Deming states that the alternative to extrinsic motivation can be found through leadership. If the leadership uses statistics to try to understand the performance of themselves and their people, then the organization can work in an environment where continuous improvement becomes the driving force. The workers become key players, and their ideas are incorporated into the continuous improvement cycle. Deming believes that it is up to management to lead the organization away from the forces that rob people of pride and joy in their work (such as management by objectives, incentive pay and quotas). Through leadership, then, Deming believes that the power of the individual can be restored.

d. Theory of Knowledge

Deming's view is that theory is required to advance knowledge. Concurrently, good management requires prediction, which is based on knowledge. Knowledge is obtained by using scientific methods [Ref. 5:p. 154]. Deming has developed a method for continuous process improvement, which is called the Plan-Do-Check-Act (PDCA) Cycle. According to Deming, the PDCA cycle allows managers to predict based on knowledge. Also called the Deming Cycle

or the Shewhart Cycle, it is a procedure for the improvement of stable processes which do not meet customer requirements or specifications. [Ref. 17:p. 35]

3. Deming's 14 Points of Management

Although Dr. Deming's background is in statistics, a large part of his popularity can be traced to his attempt to merge statistics and management philosophy. Based on the failures of his early efforts at implementing statistical thinking in industrial America, Dr. Deming came to realize that the use of statistical methods would not survive in an organization without their acceptance by management. [Ref. 6:p. 33]

In the last 40 years, Dr. Deming has developed a philosophy of management, which he calls the 14 Points of Management [Ref. 18:pp. 2-3]:

(a) Create and publish to all employees a statement of the aims and purposes of the company or other organization. The management must demonstrate constantly their commitment to this statement.

The goal of an organization, according to Dr. Deming, is to stay in business and provide jobs through innovation and research. The organization should accomplish this through strategic planning. Strategic planning by management allows the organization to embark on a continuous cycle of improvement, and also serves to reduce the variation in the organization's course [Ref. 17:p. 14]. Deming's first point of management has been embraced by the

DON, which is now incorporating strategic planning into its organizations [Ref. 19:p. 4].

(b) Learn the new philosophy, top management and everybody.

Dr. Deming states that:

> Point two really means in my mind a transformation of management. Structures have been put in place in management that will have to be dismantled. They have not been suitable for two decades. They were never right, but in an expanding market, you couldn't lose. [Ref. 6:p. 59]

Deming's second point, then, calls for an unconditional adoption of his system of management.

(c) Understand the purpose of inspection, for improvement of processes and reduction of cost.

Conventional industrial practices would call for elaborate systems to inspect their final product. Dr. Deming states that "Quality comes not from inspection but from improvement of the process" [Ref. 6:p. 60]. Inspections by the old method result in expensive rework and scrap inventories. Dr. Deming also criticizes the conventional practice of inspecting products based on specification. He notes that the Taguchi Loss Function clearly shows that loss is incurred through this method, and that increased quality/decreased cost can be achieved only through emphasis on decreasing variation [Ref. 6:p. 61].

(d) End the practice of awarding business on price tag alone.

Dr. Deming states that the use of more than one supplier by any organization results in loss by variation of

their products, which causes further variation when organizations jump from vendor to vendor. The use of many suppliers also produces a reliance on specifications, which become barriers to continuous improvement. [Ref. 17:pp. 131-133]

(e) Improve constantly and forever the system of production and service.

This point relates directly to the PDCA Cycle. In order to reduce variation, the organization must strive for continuous improvement of product and service. According to Dr. Deming, management is obligated to continually look for ways to reduce waste and improve quality [Ref. 6:p. 66]. Management must also foster an environment where innovation is encouraged, because without innovation, the system of production and service does not improve.

(f) Institute training (for skills).

Dr. Deming criticizes the conventional management practice of instituting on-the-job training. He believes that it contributes to variation, because workers are often being taught by other workers who were never properly trained [Ref. 6:p. 68].

Dr. Deming stresses that all workers need to be trained in the use of statistics. Through the work of Dr. Shewhart, Dr. Taguchi, Dr. Deming and others, a wide variety of statistical methods have been developed to aid workers in

process measurement and analysis, and management in decision-making.[5]

As part of its efforts to implement TQL throughout the Navy, the DON has established TQL training departments on both coasts, and senior leaders of the Navy are being trained in Total Quality concepts. Additionally, naval personnel are attending the schools to learn how to teach others in the use of TQL principles and statistical techniques.

(g) Teach and institute leadership.

Dr. Deming believes that the responsibility of management is to discover the barriers that prevent workers from taking pride in what they do. They must also know their worker's jobs, be able to adequately train their workers, and take responsibility for their workers' success and failure. [Ref. 4:p. 71]

(h) Drive out fear. Create trust. Create a climate for innovation.

Dr. Deming states that people are afraid to point out problems or to innovate in organizations because they are afraid of losing their raises, promotions, or jobs. In these organizations, people try to preserve the status quo. Deming believes that for better quality and productivity, people must feel secure. In his words, "Fear takes a

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[5]For a detailed analysis of Total Quality statistical tools, see Ref. 6, Chapter 20, Ref. 17, Chapter 11, and Asaka, T. and Ozeki, K.'s Handbook of Quality Tools, Productivity Press, 1990.

horrible toll". [Ref. 6: p. 73]

(i) Optimize toward the aims and purposes of the company, the efforts of teams, groups, staff areas, too.

Dr. Deming argues that in many instances, different staff areas in an organization will have competing goals and performance measures. He writes:

> Is it management's job to help staff areas work together? To promote teamwork? Sounds great, but it can't be done under the present system. In spite of the system, you will find teamwork. But when it comes to a showdown under the present system and someone has to make a decision - his own rating or the company's - he will decide for himself. Can you blame him? People work in the system. **Management creates the system.** [Ref. 6:p. 75] (Emphasis added)

The DON is moving towards better goal congruence and coordination of effort. As part of the TQL implementation process, commands are establishing Executive Steering Committees (ESC), Quality Management Boards (QMB), and Process Action Teams (PAT). This layered approach to quality improvement involves all levels of an organization in the quality improvement process, and allows the organization to coordinate and optimize its efforts. At the highest level of an organization, the ESC determines its strategic quality policy and sets strategic goals. The QMB sets product/process improvement goals and plans, and determines product/process changes. At the lowest level of the organization, the PAT is responsible for data collection and the removal of special causes.

(j) Eliminate slogans, exhortations, and targets for the workforce.

In his analysis of Dr. Deming's teachings on this point, author William W. Scherkenbach writes:

> Certainly motivation and personal awareness are contributors to limiting the variability of the people in a process. But they are no substitute for training. They are no substitute for knowledge of the process. They are no substitute for the tools and methods necessary to help manage the process. Many managers know this, but still hedge their bets on the chance that their people really want and need these slogans and exhortations to do their work. The fact is that their money would be better spent on changing management systems so that their people could improve. [Ref. 17:p. 83]

The DON and the other military services have always used motivational and personal awareness messages. A barometer of how well TQL is accepted in DON may be the decrease in the amount of exhortation and use of targets in organizations.

(ki) Eliminate numerical quotas for production. Instead, learn and institute methods for improvement.

(kii) Eliminate M.B.O. (Management By Objective). Instead, learn the capabilities of processes, and how to improve them.

Dr. Deming states that quotas take account only of numbers, not quality or methods. Quotas force the workers to emphasize the meeting of goals over the production of quality. They also tend to confuse the person's understanding of the job, as it becomes difficult to determine if the job is to meet the goal or standard, or to meet the customers' needs. He also believes that the

established practice of "management by objectives" is often inconsistent with process improvement, because the worker is only rewarded for meeting the established goal. [Ref. 17:p.86]

(l) Remove barriers to pride of workmanship.

In an assessment of Dr. Deming's work, Scherkenbach writes that barriers to pride of workmanship include performance appraisal systems, daily production reports, and an organization's financial management system [Ref. 6:p. 47]. He singles out the U.S. Navy as having a performance appraisal system that actually increases the variability of performance in people by making them change their behavior to accommodate the rating system [Ref. 6:p. 51]. He also states that the current appraisal systems often lead to "bracket creep" in the rating process. Furthermore, he criticizes performance appraisal systems for contributing to "management by exception", where managers focus on correcting exceptions, and not the process [Ref. 17:p. 53]. He also criticizes daily production reports as being indicative of management nearsightedness, and financial management systems for focusing only on the short-term. [Ref. 17:p. 71]

(m) Institute a vigorous program of education and retraining.

According to Dr. Deming, members in an organization must continually develop new knowledge and

skills. As productivity improves, however, fewer people will be needed to get the job accomplished. Dr. Deming emphasizes that management should make it clear that no one will lose a job because of productivity improvements. Managers must then educate and retrain their workers into new jobs and responsibilities. [Ref. 6:p. 84]

(n) Take action to accomplish the transformation.

The last of Dr. Deming's 14 Points of Management is a call-to-arms for management. He states that management must agree on the first 13 points, and they must agree to carry out the new philosophy. The top management must then explain the changes to a "critical mass" of people in the organization. The critical mass must understand the 14 points so that they can use them. It is the responsibility of management to see to it that everyone in the organization, supply base and distribution network is trained in the ways to continually improve. [Ref. 6:p. 88]

Deming's 14 Points of Management are important for understanding total quality ideas because they provide a fairly simple explanation of what an organization must do to adopt and use total quality principles. Their simplicity, however, disguise one particular complexity: no two organizations are alike, and how they decide to put into practice the 14 points will differ. This point has not been lost on TQL planners in DON, who have taken care to ensure

that TQL students learn the philosophy of the 14 points, while allowing commands the leeway to implement TQL using their own initiatives and schedules.

While the DON organizations will embark on a course towards total quality, if, how and when they get there is yet to be determined. The 14 points can serve as a useful frame of reference to determine what an organization is actually doing in its efforts to adopt the TQL philosophy. As the next chapter describes, the 14 points can be used to describe the conduct of TQL in organizations.

C. THE TQL/OPEN SYSTEMS THEORY LINK

1. Introduction

A search and review by the author of past work in the areas of TQL and Open System theory found no evidence that an attempt had ever been made to explain how the two philosophies could be similar in many ways. Up to now, TQL and its underlying philosophies have been used for practical application in organizations. The ideas ingrained in the philosophy lend themselves to practical use, which may in part account for how Dr. Deming's work has found a wide degree of acceptance. Open Systems Theory, on the other hand, set the stage for the practice of Organizational Development (OD) as a means to improve organizations. TQL, then, is easier to interpret for practical use, while Open Systems Theory, as a relatively abstract idea, has been

reinterpreted through models that follow the spirit of the theory. This section will show how Open System Theory is compatible with the TQL philosophy and how the Open System model can be used to assess organizations working in a TQL environment.

The connection between Open Systems Theory and TQL is found in both areas' emphasis that organizations have a dynamic interaction of input, throughput, and output. Open Systems Theory talks about the interaction in abstract terms such as "negative entropy" and "dynamic homeostasis", while TQL addresses the interaction in terms of optimizing the extended system of the organization, which includes the customer and suppliers. In essence, the two disciplines look at organizations from a different angle: one from a theoretical viewpoint and the other from a practical view. TQL, then, is putting into practice what Open Systems Theory espouses. The interpretation of the theory is Dr. Deming's, just as all other practitioners have reinterpreted Open Systems Theory to give it a practical bent. The following description of the links between major Open System ideas and TQL philosophy illustrate this point. In this section, the sub-categories of open systems are listed with an explanation of how TQL integrates the idea into its philosophy.

a. Importation of Energy

TQL philosophy stresses the importance for the organization to cultivate relationships with suppliers and customers. The suppliers then give the organization what it needs so that it can in turn meet the customer's needs. By maintaining close feedback loops with the customer the organization can continuously improve on the customers needs. The organization imports energy from suppliers by getting what it needs from them, as well as energy from customers by knowing exactly what customers want and using that information to "delight" the customer with superior products and services.

b. Throughput

The TQL philosophy concerns itself greatly with organizational throughput by continuously improving supplier-organization relationships that focus on improving the quality of raw materials, managing the continuous improvement of internal processes, and focusing improvement on meeting customers' needs now and in the future.

c. Output

The TQL philosophy concerns itself very strongly with the output function of organizations by recognizing the link between the organization's health and the goods or services it produces. While noting that organizations must pay attention to output, however, the philosophy also

stresses that organizations concern themselves with the internal processes that affect the output and outcomes. As with Open Systems Theory, then, the TQL philosophy views output as one component of the forces that affect organizations.

d. Negative Entropy

TQL philosophy acknowledges that the stagnant organization loses out to competitors, eventually going out of business. TQL philosophy focuses on improving quality through innovation and continuous improvement. This leads to a "chain reaction" that allows the organization to move ahead of its competitors. This idea relates directly to the Open Systems Theory view of negative entropy, which is that organizations that do not acquire negative entropy move towards disorganization or "death".

e. Information input, negative feedback, and the coding process

As mentioned in section A, organizations obtain feedback on their output, and take corrective action when needed. The feedback goes through a coding process, where it is placed into a category found to be most relevant for the system. TQL philosophy views feedback as an important component of the supplier-organization-customer link, and stresses the importance of placing valid, definable and understandable operational definition on product or service

criteria.

Other sub-categories of Open Systems Theory do not lend themselves to easy interpretations of their relationship to TQL, although the relationships still exist. For example, "dynamic homeostasis" is a concept that is also found in writings on the "system thinking" elements of Deming's System of Profound Knowledge, albeit in different form. These abstract ideas are not incompatible with TQL: they simply look at another dimension of open systems and by their sheer abstractedness are more difficult to compare to TQL.

The work of OD practitioners in developing open system models to assess organizations greatly facilitates the use of Open Systems theory in explaining what occurs in organizations. As displayed earlier in Harrison's assessment model, the model's sub-components can be used to assess what is occurring in the open system, and are addressed in relatively similar form in "total quality" literature. For example, Harrison's model examines the dynamics of behavior and processes, which includes assessment categories such as leadership, planning, group-learning, coordination, and so on. These assessment categories detail the criteria that the TQL philosophy also concerns itself with greatly: leadership, planning, optimization, team-skills, etc. The compatibility of Open System Theory and the TQL philosophy, then, allows the open

systems model and its components to be used as explanatory variables in determining how and why organizations practice TQL in the manner that they do. It also allows the Open Systems theory ideas to be used as the theoretical framework for findings and conclusions about organizations that practice TQL.

III. METHODOLOGY

This chapter describes the survey instrument, structure of analysis, and statistical method used in this thesis.

A. RESEARCH DESIGN

This thesis determines what significant differences, if any, exist in the conduct of TQL in operating force and shore establishment organizations. Therefore, a valid survey had to be developed to measure the differences between the organizations. The survey had to determine how the organizations conduct TQL and had to assess the depth of their TQL conduct by asking questions related to generally accepted Total Quality assessment criteria. The returned surveys underwent statistical analysis to determine if there were significant differences in the conduct of TQL in the two organization types.

1. Survey Instrument

Appendix A is the questionnaire that was developed for this thesis. The questionnaire is based on Dr. Deming's "14 Points of Management", and it attempts to document what each organization surveyed did or did not do in its conduct of TQL.

The questions used for the survey deal with two general areas of organizational assessment and "total quality": tools and processes. The first part of the questionnaire measured the respondent's use of "tools", which for purposes of this study are defined as the specific analytical techniques used to promote quality and/or productivity improvements in the organization, such as flow charts and cause-and-effect diagrams, for example. The second part of the survey measures "processes", which for purposes of this study is defined as the "total quality" policies, practices and procedures used by the organization. Examples of these are the use of teams for process assessment, and the training of organizational members in statistical process control.

The questionnaire consists of 104 statements related to the tools and processes of Total Quality Leadership. Each statement has a "yes/no" answer option, where the respondent indicates if the specified technique, policy, practice or procedure is used by the organization. Each statement details a particular action that indicates the acceptance or practice of one component of Deming's "14 Points of Management". The 14th, or last "Point of Management" was omitted from the survey because it incorporates the first 13 points, and it would have resulted in redundancy in the final tabulation of results.

The questionnaire is broken down into sections that assess actions related to a particular "Point." Appendix B shows what statements assess each of the first 13 points. The questionnaire also included space for the respondent to add to the data by commenting on the validity of the questions, assumptions made when answering the questionnaire, and for making any other comments deemed necessary. The questionnaire was prefaced by a cover letter, instructions for completing the questionnaire, and a glossary, which are found in Appendix A.

The cover letter included an explanation to respondents that the results of the questionnaire would only be tabulated by operating force and shore establishment category; individual commands would not be named in the survey. This was done to protect the individual command's confidentiality and to help ensure that respondents were not under any pressure to distort the reality of the conduct of TQL in their organizations. Respondents were asked to leave their name and their command's name off of the returned questionnaires. This was done to protect the confidentiality of the commands.

They were also asked to indicate the approximate year and month that their organization started implementing TQL, and to indicate their organization type (operating forces or shore establishment).

B. STRUCTURE OF THE ANALYSIS

1. Sample Size

The questionnaire was mailed to TQL Coordinators at 28 DON commands: 16 shore establishment and 12 operating force commands. Of these mailings, 19 questionnaires were returned: 11 from the shore establishment and eight from the operating forces. The sample size was limited by the relatively small number of operating force commands that had started implementation of TQL. In fact, the 12 operating force commands that were mailed questionnaires represented the only DON commands that had "TQL Coordinators" in place to respond to the survey, as of July 1992.

2. Demographics

The distinction between what constituted "operating forces" and "shore establishment" in this survey was made as follows: "operating forces" refers to the four fleets, sea-going forces, district forces, Fleet Marine Forces, the Military Sealift Command, shore-based fleet training groups and fleet replacement squadrons and such shore activities of the Navy and other forces as could be assigned by the President or Secretary of the Navy as operating forces, while "shore establishment" refers to the DON field activities.

The questionnaire was sent to the TQL Coordinator for each command. The TQL coordinators were selected to

answer the questionnaires because they had been trained in Total Quality Leadership, and their positions allowed them to assess the tools and processes of their entire organization. The potential for bias on the part of survey respondents was a known problem prior to the mailing of the surveys. Therefore, the cover letter attached to the questionnaires addressed the issue with the respondents, in the hopes of reducing bias in the answers (see Appendix A).

A concern during the study was to reduce the variance in responses that could be attributed to the differences in the length of time that organizations had been exposed to TQL tools and processes. While it was impossible to measure how much the "time" factor could affect the responses, an educated guess was that it could have some effect on the scores. Therefore, one organization with over five years of TQL exposure time was not included in the statistical analysis.

The statistical analysis conducted in this study was performed with sixteen commands: eight operating force and eight shore establishment organizations, respectively. Furthermore, the organizations were later broken down into four operating force and five shore establishment organizations to compare organizations exposed to TQL for less than one year, and three shore establishment and four operating force organizations to compare organizations exposed to TQL for at least one year.

Two other returned questionnaires were excluded from the statistical analysis for the following reasons:

- one returned questionnaire indicated that the TQL coordinator at the command had not been trained in TQL.
- another respondent failed to provide questionnaire input for the stated reason that his organization was "not far enough along" to provide any input.

The range of TQL exposure time for the operating forces organizations was four to 18 months. The exposure time for shore establishment organizations was from one to 22 months.

3. Drawing Conclusions From the Data

The operating force and shore establishment organizations were compared in a number of ways to determine if there were statistically significant differences between them:

- in the conduct of TQL in their organizations.
- in the conduct of TQL in their organizations, after they were further categorized by length of TQL exposure time.
- in the use of TQL tools and processes related to Deming's 14 Points of Management.
- in the use of specific TQL tools and processes.
- in the use of specific TQL tools and processes, after they were further categorized by length of TQL exposure time.

To accomplish the analysis, a non-parametric statistical testing procedure was used to assess the differences between the organization types. The individual responses were tabulated to arrive at a score (1 point for a "yes" answer and 0 points for a "no" answer) and the scores were ranked to note statistically valid differences. The data was then examined through statistical analysis to determine if separate organization types may have differed in their adoption of the TQL tools and processes. The statistical testing procedure used in this thesis is a non-parametric method called the Mann-Whitney test and is described in greater detail in the next section.

Descriptive statistics were also used to examine the data from the questionnaires. The mean, standard deviation, and range of the data sets were reported to note trends and to generally augment the findings of the Mann-Whitney statistical testing, which were limited in validity by the relatively small sample sizes that were compared.

The data acquired from the analysis was used to develop conclusions about the differences in the conduct of TQL in DON operating force and shore establishment organizations, and serve as the statistical basis for the ensuing recommendations.

C. TESTING PROCEDURE

This thesis uses the Mann-Whitney non-parametric testing procedure to determine significant differences that may exist between the shore establishment and operating force organizations in their conduct of TQL.

The Mann-Whitney test was chosen because one could not assume that the data acquired from the organizations was normally distributed, and the Mann-Whitney test does not have the requirement for using normally distributed populations for assessment.[6]

Two assumptions about the data had to be made when using the Mann-Whitney test. The first was that each of the samples (both types of organizations) were independent. The second assumption was that each of the populations had the same general shape of distribution.

Since the intent of the testing was to determine the significant differences in the conduct of TQL in shore establishment and operating force organizations, the data had to be looked at in several ways to assess the differences in the "conduct" of TQL in each organization type.

The "conduct" of TQL was measured in two dimensions: in the number and type of tools and processes that the

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[6]For a more detailed treatment of the Mann-Whitney non-parametric testing procedure, see Weiss, N.A. and Hasset, M.J.'s Introductory Statistics, Addison-Wesley Publishing Company, 1991.

organizations used. To measure the organizations in both dimensions, the data had to be manipulated in different ways. The first three iterations of the Mann-Whitney test looked at how the two organization types compared in the sum of their use of TQL tools and processes. The next three Mann-Whitney iterations looked at how fully the organization types used the TQL tools and the processes, which were grouped in their relation to the first 13 of Deming's 14 Points of Management. The final three iterations measured how the organization types differed in their use of the 104 tools and processes listed in the questionnaire.

Using a ranking procedure for the data, a test statistic value was derived that determined if the means of the operating force and shore establishment organizations being compared were significantly different. If the test statistic value fell outside of the allowable region (as denoted in the statistical table), it indicated that there were statistically significant differences in the means. The 5% level of significance used for the test also indicated if the means were significantly different. If a sample mean was below the 5% significance level, the means of the compared organization types were determined to be significantly different.

When all data findings were made, the results were tabulated and appear as tables in Chapter IV. Findings that indicated significant differences between populations are

highlighted, and form the basis for the discussion in the next chapter.

IV. PRESENTATION AND ANALYSIS OF DATA

This chapter presents and analyzes the data derived from a statistical analysis of the 16 returned questionnaires to determine if TQL differs in the DON operating forces and shore establishments.

The chapter opens with a review of the major findings with the analysis organized from broad to more specific areas of assessment. Each level of analysis is augmented by descriptive statistics and/or diagrams to explain the data results. The data is explained using an Open Systems model of organizations to describe the dynamics involved in organizational use of TQL tools and processes. The chapter concludes with a summary of the data analysis findings, which form the basis for the conclusions and recommendations developed in Chapter V.

A. DATA ANALYSIS AND FINDINGS

As described in earlier chapters, the intent of the statistical analysis is to determine what significant differences, if any, existed in the conduct of TQL in DON operating force and shore establishment organizations. In all cases, the analysis was made using a 5% "level of significance", meaning that there would be a 5% chance that

the researcher would conclude, based on the data results, that the mean scores differed between the organization types when in fact no difference existed.

The data is grouped in 15 tables that are arranged so that the primary questions about the tested population samples are answered first, followed by the secondary research questions. The following sections present and discuss the data results for each major assessment category that helped answer the research questions. The sections begin with a description of the Mann-Whitney test results that were used to assess a particular data set, and are followed by a display of the descriptive statistics acquired from the data. Where applicable, cause-and-effect diagrams which incorporate major sub-components of Harrison's Open Systems Model are used to interpret the data.

1. Assessing the differences between all operating force and shore establishment organizations surveyed in the conduct of TQL

The thesis's primary research question was: Is there a significant difference in the way the DON operating forces and shore establishment conduct TQL? In helping to answer that question, the questionnaires completed by the tested organizations measured their use of 104 specific TQL tools and processes. A score of one was given for each tool or process used by the organization. Therefore, an

organization could score anywhere from zero to 104 points on the questionnaire. Using the Mann-Whitney test, the scores of each organization were then grouped into two categories: operating forces and shore establishment, and their means were derived. The means were then compared through the Mann-Whitney ranking procedure, and the test statistic was derived.

Table 1 helps answer the primary research question by determining if there is a difference in the number of TQL tools and processes used by the organization types. The table shows the results of the Mann-Whitney test performed on the eight operating force and shore establishment organizations in this study. The critical values Ml and Mr denote the upper and lower limit coefficients that are found in statistical tables that measure the Mann-Whitney test statistic. M represents the test statistic computed from the sample data. If the test statistic value falls in between Ml and Mr, we can conclude there is no significant difference in the number of TQL tools and processes used by both organization types; if the test statistic value is on or outside of Ml and Mr, we can conclude there is a significant difference.

In Table 1, the critical values are 49 and 87. The test statistic M is 71.5. Therefore, Table 1 shows that the mean scores of the grouped data sets, which measure the average number of tools and processes that are used by the

two organization types, are not significantly different. We can conclude that there is no significant difference in the number of TQL tools and processes used by the two organization types.

TABLE 1
MANN-WHITNEY TEST
OPERATING FORCES VS. SHORE ESTABLISHMENT
(5% Significance Level)

Critical Values		Test Statistic	Significant
Ml	Mr	M	Difference?
49	87	71.5	NO

Table 2 shows the mean and standard deviation of the two organization types. Although Table 1 indicated there was no statistically significant difference in the number of TQL tools and processes used by the two organization types, Table 2 shows there are some obvious differences in the average number of TQL tools and processes that each organization type used. Specifically, the operating force organizations used a higher average number of TQL tools and processes, and the shore establishment organizations had a larger standard deviation and range for TQL tool and process use.

TABLE 2
MEAN, STANDARD DEVIATION AND RANGE
OPERATING FORCES AND SHORE ESTABLISHMENT

	Mean	Standard Deviation	Range
Operating Forces	59.62	18.02	34-89
Shore Establishment	49.87	34.10	9-101

Although the Table 2 data showed there were differences in the average number of TQL tools and processes used by the two organization types, it did not actually contradict the findings of Table 1, which showed that the difference was not statistically significant. The importance of the Table 2 findings is that they show how descriptive statistics help explain the data better: there are notable differences in the organizations' use of TQL tools and processes. The findings in Table 2 also suggest that comparisons of the two organization types using other assessment criteria may show trends that will enable the researcher to make more definitive conclusions about differences in the two organization types. Taken by itself, the data results in Table 2 do not answer this thesis's research questions. However, comparing the results to other test results that use different assessment criteria, such as "exposure time to TQL," may help lead to stronger conclusions about the differences in the conduct of TQL by operating force and shore establishment organizations.

2. Assessing the differences between operating force and shore establishment organizations surveyed in the conduct of TQL - organizations grouped by exposure time to TQL

The tables on the next page develop the Table 1 data

a step further by dividing the sample data into two groups: organizations exposed to TQL for less than a year, and organizations exposed for at least a year. Table 3 and 4 show the results of the Mann-Whitney test comparing the mean scores of the operating force and shore establishment organizations that fall within those particular time periods. The results indicate the test statistic M falls within the boundaries established by the critical values Ml and Mr. Therefore, we can conclude there are no significant differences in the grouped average number of TQL tools and processes used by the organizations that are compared in the two tables.

TABLE 3
MANN-WHITNEY TEST
OPERATING FORCES VS. SHORE ESTABLISHMENT
LESS THAN 1 YEARS EXPOSURE TO TQL
(5% Significance Level)

Critical Values		Test Statistic	Significant
Ml	Mr	M	Difference?
12	28	24	NO

TABLE 4
MANN-WHITNEY TEST
OPERATING FORCES VS. SHORE ESTABLISHMENT
AT LEAST 1 YEARS EXPOSURE TO TQL
(5% Significance Level)

Critical Values		Test Statistic	Significant
Ml	Mr	M	Difference?
6	18	14.5	NO

Further statistical testing of this data showed that although the Mann-Whitney test did not find statistically

significant differences in mean scores, there were notable differences in the data of the means, standard deviations, and ranges, as shown in Tables 5 and 6. Table 5 shows the results of comparing the organization types when those organizations have less than one year of TQL exposure and Table 6 shows the results of comparing the organization types when they have had at least one year of TQL exposure. Table 5 shows notable differences in the means, standard deviations, and ranges of the two organization types when those organizations have less than one year of TQL exposure. However, Table 6 shows that the statistical differences between the two organization types are negligible when those organizations have at least one year of TQL exposure. The results of Table 5 and 6, then, indicate that the greatest differences in the use of TQL tools and processes were found between operating forces and shore establishment organizations that had less than one year of exposure to TQL.

TABLE 5
MEAN, STANDARD DEVIATION AND RANGE
OPERATING FORCES AND SHORE ESTABLISHMENT
LESS THAN ONE YEAR EXPOSURE TO TQL

	Mean	Standard Deviation	Range
Operating Forces	52.00	19.80	34-80
Shore Establishment	38.00	38.26	9-101

TABLE 6
MEAN, STANDARD DEVIATION AND RANGE
OPERATING FORCE AND SHORE ESTABLISHMENT
AT LEAST ONE YEAR EXPOSURE TO TQL

	Mean	Standard Deviation	Range
Operating Forces	67.25	14.52	59-89
Shore Establishment	69.67	14.15	61-86

Before analyzing why the Table 5 means showed a difference when comparing organizations with less than one year of TQL exposure, an analysis is made of how the organization types compared when assessing their use of the TQL tools and processes as they relate to the 14 Points of Management.

3. Assessing the differences between operating force and shore establishment organizations surveyed in the use of TQL tools and processes related to Deming's 14 Points of Management

The data in the first six tables provided a general overview of how the organizations compared in the average number of TQL tools and processes they employed. As the results showed, no significant differences could be discerned, although descriptive statistics showed that the greatest differences were found when comparing the organizations with less than a year of TQL exposure. The next step was to divide the questionnaire results into two

sub-categories: TQL tools and processes.

As described in Chapter III, the questionnaire consisted of 104 questions that were grouped into categories based on TQL tools and DON's version of Deming's 14 Points of Management (Appendix B lists the questions that applied to particular points). Table 7 shows the results of the Mann-Whitney test comparing the mean scores of the aggregate operating force and shore establishment organizations. As the table's data results indicate, no significant differences were found in the amount of use of TQL Tools or processes related to Demings "14 Points" by the two organization types.

TABLE 7
MANN-WHITNEY TEST
OPERATING FORCES VS. SHORE ESTABLISHMENT
USE OF TQL TOOLS AND POINTS OF MANAGEMENT

Assessment Area	Critical Value Ml	Mr	Test Statistic M	Significant Difference?
TQL Tools	49	87	82.0	NO
Point 1	49	87	71.0	NO
Point 2	49	87	79.0	NO
Point 3	49	87	74.0	NO
Point 4	49	87	68.0	NO
Point 5	49	87	69.0	NO
Point 6	49	87	75.0	NO
Point 7	49	87	71.0	NO
Point 8	49	87	71.5	NO
Point 9	49	87	68.0	NO
Point 10	49	87	76.0	NO
Point 11	49	87	77.0	NO
Point 12	49	87	77.5	NO
Point 13	49	87	76.0	NO

As with previous Mann-Whitney result tables used in this chapter, the analysis in Table 7 was extended in Tables

8 and 9, where the population samples were separated into two groups: organizations with less than a year's exposure to TQL and organizations with at least a year of exposure. The data in these tables show there were no significant differences in the scores for each organization type even when broken down into more detailed categories.

TABLE 8
MANN-WHITNEY TEST
OPERATING FORCES VS. SHORE ESTABLISHMENT
LESS THAN 1 YEAR EXPOSURE TO TQL
USE OF TQL TOOLS AND DEMING'S POINTS OF MANAGEMENT
(5% Significance Level)

Assessment Area	Critical Value Ml	Mr	Test Statistic M	Significant Difference?
TQL Tools	12	28	26.0	NO
Point 1	12	28	22.0	NO
Point 2	12	28	26.5	NO
Point 3	12	28	22.0	NO
Point 4	12	28	18.0	NO
Point 5	12	28	23.0	NO
Point 6	12	28	20.0	NO
Point 7	12	28	23.0	NO
Point 8	12	28	23.5	NO
Point 9	12	28	21.0	NO
Point 10	12	28	23.0	NO
Point 11	12	28	22.5	NO
Point 12	12	28	26.5	NO
Point 13	12	28	23.0	NO

Tables 7 through 9 showed there was no statistically significant difference in the number of TQL tools and processes related to Deming's "14 Points" used by each organization type. The conclusion also held when dividing the organizations into those that had less than a year of TQL exposure and at least a year of TQL exposure.

TABLE 9
MANN-WHITNEY TEST
OPERATING FORCES VS. SHORE ESTABLISHMENT
AT LEAST 1 YEAR EXPOSURE TO TQL
USE OF TQL TOOLS AND POINTS OF MANAGEMENT

Assessment Area	Critical Value Ml	Mr	Test Statistic M	Significant Difference?
TQL Tools	6	18	10.0	NO
Point 1	6	18	12.0	NO
Point 2	6	18	12.5	NO
Point 3	6	18	11.5	NO
Point 4	6	18	17.5	NO
Point 5	6	18	14.5	NO
Point 6	6	18	9.0	NO
Point 7	6	18	12.5	NO
Point 8	6	18	12.5	NO
Point 9	6	18	13.5	NO
Point 10	6	18	11.5	NO
Point 11	6	18	10.0	NO
Point 12	6	18	13.0	NO
Point 13	6	18	12.0	NO

Assessing the mean and standard deviation for the data used in Tables 7 through 9 show that although the Mann-Whitney test procedure found no significant statistical differences, there were still notable differences between the shore establishment and operating forces in the amount of use of TQL tools and processes related to the "14 Points". The analysis of mean and standard deviations of the data sets are found in Tables 10 through 12.

The Table 10 data show that the operating forces used a higher average number of TQL tools and processes related to the "14 Points" in 13 out of 14 assessment categories. The standard deviation data also show that the shore establishment organizations had a wider deviation

within their group in the number of tools and processes used.

TABLE 10
MEAN AND STANDARD DEVIATION
OPERATING FORCES AND SHORE ESTABLISHMENT
USE OF TQL TOOLS AND PROCESSES RELATED TO 14 POINTS

	Operating Forces		Shore Establishment	
	Mean	Standard Deviation	Mean	Standard Deviation
TQL Tools	6.00	4.21	3.62	4.81
Point 1	7.62	2.67	6.75	5.80
Point 2	5.12	1.13	3.75	2.31
Point 3	1.37	.91	1.00	.92
Point 4	1.00	.92	1.00	.75
Point 5	7.75	3.32	7.00	5.63
Point 6	3.00	1.85	2.37	1.68
Point 7	10.50	4.37	9.50	6.04
Point 8	5.12	2.10	4.75	2.71
Point 9	4.25	2.05	4.12	2.80
Point 10	.62	.52	.37	.52
Point 11	1.12	.83	.75	1.16
Point 12	4.50	1.77	3.62	2.13
Point 13	1.62	.74	1.25	.89

The data in Tables 11 and 12 bring the differences found in Table 10 into sharper focus. Comparing both tables, the results show that the greatest differences in the data sets were found when comparing organizations that had less than one year of TQL exposure.

Table 11 shows that the operating force organizations with less than one year of exposure used a higher average number of TQL tools and processes related to the "14 Points" in 12 of the 14 assessment categories.

TABLE 11
MEAN AND STANDARD DEVIATION
OPERATING FORCES AND SHORE ESTABLISHMENT
LESS THAN ONE YEAR OF EXPOSURE TO TQL
USE OF TQL TOOLS AND PROCESSES RELATED TO 14 POINTS

	Operating Forces		Shore Establishment	
	Mean	Standard Deviation	Mean	Standard Deviation
TQL Tools	4.75	2.36	2.40	4.83
Point 1	7.25	2.87	5.80	7.12
Point 2	4.75	.96	2.60	1.95
Point 3	1.00	1.15	.60	.89
Point 4	.50	.57	.80	.84
Point 5	7.00	3.56	4.80	6.06
Point 6	2.50	2.38	2.40	2.07
Point 7	9.50	3.87	7.40	6.54
Point 8	4.75	2.06	3.80	3.11
Point 9	2.50	1.00	2.80	2.77
Point 10	.50	.58	.20	.44
Point 11	1.00	.82	.80	1.30
Point 12	4.75	1.50	3.00	2.34
Point 13	1.25	.96	.80	.84

However, the results in Table 12 show that when both organizational types had at least one year of TQL exposure, the operating force organizations used a higher average number of TQL tools and processes in only six of the 14 assessment categories. Furthermore, the results in Table 12 showed that the means for both organization types were generally very similar.

The differences in standard deviations of the means for the organization types was greatest with the organizations having less than one year of TQL exposure. Table 11 shows that the shore establishment organizations surveyed had larger standard deviations in 10 of the 14 assessment categories. However, Table 12 showed that the

means of the two organization types generally had the same standard deviation when the organizations compared had been exposed to TQL for at least a year.

TABLE 12
MEAN AND STANDARD DEVIATION
OPERATING FORCES AND SHORE ESTABLISHMENT
AT LEAST ONE YEAR OF EXPOSURE TO TQL
USE OF TQL TOOLS AND PROCESSES RELATED TO THE 14 POINTS

	Operating Forces		Shore Establishment	
	Mean	Standard Deviation	Mean	Standard Deviation
TQL Tools	7.25	5.62	5.67	4.93
Point 1	8.00	2.83	8.33	3.21
Point 2	5.50	1.29	5.67	1.53
Point 3	1.75	.50	1.67	.58
Point 4	1.50	1.00	1.33	.58
Point 5	8.50	3.41	10.67	2.31
Point 6	3.50	1.29	2.33	1.15
Point 7	11.50	5.20	13.00	3.60
Point 8	5.50	2.38	6.33	.58
Point 9	6.00	.82	6.33	.58
Point 10	.75	.50	.67	.58
Point 11	1.25	.96	.67	1.15
Point 12	4.25	2.22	4.67	1.53
Point 13	2.00	0.00	2.00	0.00

The results found in Tables 10 through 12 reinforce the findings that were discovered in the earlier analysis of the first nine tables in this chapter: the most evident differences in the organizations were found when comparing organizations that had less than one year of TQL exposure. Although the Mann-Whitney test found no statistically significant differences when comparing those same operating force and shore establishment organizations in the use of TQL tools and processes, the descriptive statistics showed that there were notable differences in the average amount of

TQL tools and processes being used by the organizations that had been exposed to TQL for less than one year.

Through the use of a cause-and-effect diagram, major components of Harrison's Open Systems model are used to explain why the most obvious differences may be found when comparing organizations with less than one year of TQL exposure. The diagram is displayed in Figure 2, followed by a discussion on the key components that help explain why the differences were most evident when comparing organizations that had less than one year of TQL exposure.

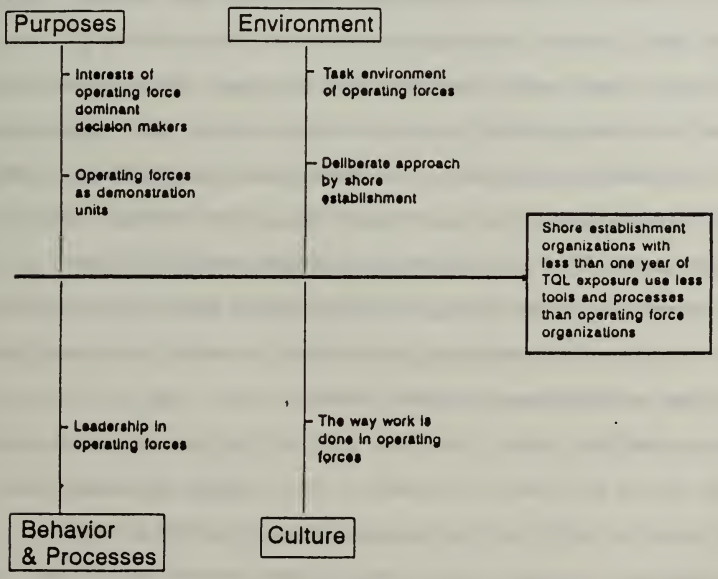
Purposes
Environment
Interests of operating force dominant decision makers
Operating forces as demonstration units
Task environment of operating forces
Deliberate approach by shore establishment
Shore establishment organizations with less than one year of TQL exposure use less tools and processes than operating force organizations
Leadership in operating forces
The way work is done in operating forces
Behavior & Processes
Culture

Figure 2
Cause-and-Effect Diagram
Assessing why shore establishment organizations with less than 1 year of TQL exposure use less TQL tools and processes

Harrison described "Purposes", which was a key component of his model, as "the strategies, goals, objectives, plans and interests of the organization's dominant decision-makers". "Purposes", therefore, ties into the idea that the operating force organizations could be using more TQL tools and processes because of the "interests" of the organization's dominant decision makers. The "interests" of the decision makers drive their strategies, goals, objectives, and plans. To understand why the interests of the operating force decision makers could cause their organizations to use more TQL tools and processes, one must remember that although both organization types had been exposed to TQL for generally the same amount of time (under one year), the shore establishment as a whole has organizations that have used TQL since the mid-1980s. On the other hand, the operating force organizations represent the first group of fleet units that have started implementing TQL, and they are doing so under the auspices of a policy statement by the CNO [Ref. 1]. As "demonstration units" for the rest of the operating forces, these units are small in number, but highly "visible" as they are the first units to undertake the CNO's TQL implementation plan. Although the questionnaire did not test for this idea, it is possible that the leaders of these operating force organizations feel as if they are under scrutiny by the DON top leadership. As a result, they may

be exceptionally vigilant in integrating the TQL tools and processes into their units as fully as possible.

"Environment" is another component of Harrison's model that may account for this difference. "Environment", in this particular case, focuses on the task environment, which are the external conditions that are directly related to an organization's main operations and technologies. The task environment of the operating forces may have subtly changed when the CNO announced his intentions to integrate the TQL philosophy into the operating forces. The operating force organizations' decision makers may view the CNO's order as putting them under sharper focus by the DON's top leadership. The shore establishment's TQL implementation effort had been well underway when the CNO decided to implement TQL in the operating forces. As a result, the shore establishment organizations that are implementing TQL tools and processes may not feel any particular pressure to function any differently from their predecessors when implementing TQL. As a result, the current pace at which they are implementing TQL may reflect a more deliberate, less urgent approach.

The sub-component "leadership" may play a role in the differences in TQL tool and process use by the two organization types as well. "Leadership", which is a part of the elements that make up the "Behavior and Processes" component in Harrison's model, could be a driving force

behind the decisions to implement certain TQL tools and processes, or even the decision on how fast to implement them. If the leadership in the operating forces feel as if they are on the "skyline" due to the focus by the DON's top leadership on their implementation efforts, they may be more diligent about getting TQL tools and processes implemented quickly and in large numbers.

The component of "culture" in Harrison's model also helps to explain the differences in the use of TQL tools and processes by the two organization types. The culture of the two organization types differs in one notable way: the operating forces must contend with the pressures brought on by having to meet operational commitments. The operational commitments determine the organizations' "op-tempo", which is typically demanding, and which fluctuates based on changes in deployment schedules caused by routine changes and emergencies. Operating force organizational members are therefore accustomed to working with a sense of urgency in a changing environment. It's possible that the operating forces may implement the TQL tools and processes faster than the operating forces because they are more accustomed to implementing changes quickly.

The data generated in the first dozen tables and Figure 2 has helped answer one dimension of the research question: that of the differences in the average amount of TQL tools and processes used by operating force and shore

establishment organizations. While the data generated in the testing went a long way towards answering this thesis' research questions, it only measured one dimension of potential difference in the two organization types: that of "amount". The other dimension of the conduct of TQL is the particular tools and processes employed. For example, the questionnaires could show that the compared organizations scored evenly in the number of TQL tools and processes employed, but the actual tools and processes used by the compared organizations could be vastly different. The Mann-Whitney test, as performed in the first six iterations, would not detect these differences. Based on the way that the questionnaire was configured, the method to assess how the organization types compared in their use of particular tools and processes was to measure how each group scored in using the 104 tools and processes described in the questionnaire. The comparison follows in the next section.

4. Assessing the differences between the operating force and shore establishment organizations surveyed in the use of specific TQL tools and processes

Table 13 shows the results of comparing the operating forces against the shore establishment organizations in their use of the 104 tools and processes listed in the questionnaire. The organization types were grouped together and their total scores for each question

were compared to each other in order to assess differences. For the sake of brevity, all tools and processes whose use between the organizations was not statistically significant were omitted from the table.

TABLE 13
MANN-WHITNEY TEST
OPERATING FORCES VS. SHORE ESTABLISHMENT
TOOLS AND PROCESSES AS DESCRIBED IN QUESTIONNAIRE
(5% Significance Level)

Question #	Test Statistic Significance Level	Significant Difference?
1	< .05	YES
34	< .05	YES

The results of Table 13 indicate that there were two specific areas where the operating forces and shore establishment had a major difference. One area was in the use of TQL tools (question 1), where only 3 of the 8 shore establishment organizations queried used flow charts to determine how processes work, and the other area was in how "middle management" accepted responsibility for quality and or productivity performance improvement (question 34), where the shore establishment middle managers accepted responsibility less than operating force middle managers.

In examining the significant difference found in question 1, a cause-and-effect diagram is used to highlight the major components and sub-components of Harrison's Open System Model that help to explain the difference. The diagram appears in Figure 3.

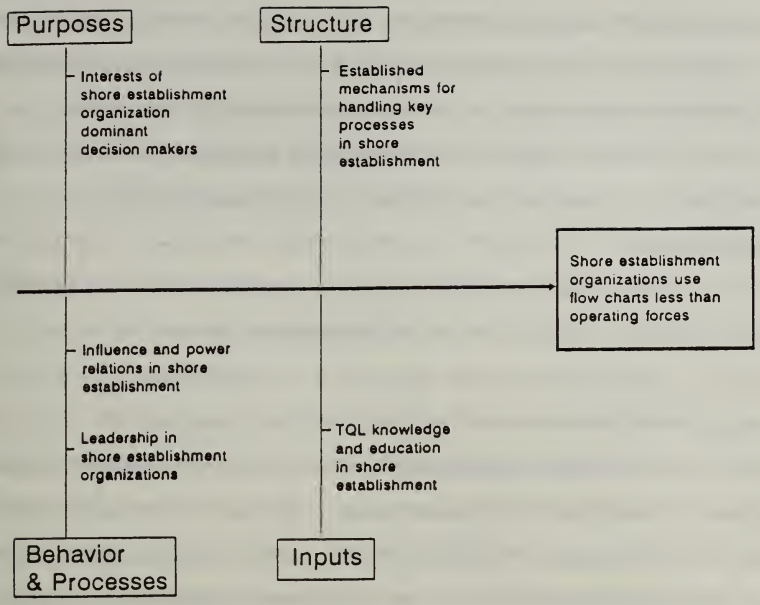
Purposes
Structure
Interests of shore establishment organization dominant decision makers
Established mechanisms for handling key processes in shore establishment
Shore establishment organizations use flow charts less than operating forces
Influence and power relations in shore establishment
Leadership in shore establishment organizations
TQL knowledge and education in shore establishment
Behavior & Processes
Inputs

Figure 3
Cause-and-Effect Diagram
Assessing why shore establishment organizations use flow charts significantly less than operating force organizations

One possible explanation for the relative lack of flow chart use in the shore establishment is that their use has not been emphasized by the decision makers in those organizations. A reason for this may be that the decision makers in those organizations do not feel that flow charts will suit their purposes. Although flow charts are important for any organization's understanding of their processes, it may be that managers in the shore

establishment view flow charts as a threat because they make it easier to show accountability for areas within a process. Therefore, "fear" may be a factor inhibiting their use, although another explanation would be required as to why the same factor would not be present in operating force organizations.

It's also possible that the structure of the shore establishment organizations discourages the use of flow charts. Harrison defines structure as including "established mechanisms for handling key processes". If the shore establishment organizations were already using another method to analyze their processes, it might discourage the use of flow charts. It should be noted, however, that there was no mention made by any of the questionnaire respondents of any other process analysis tools used by their organizations in place of flow charts. Therefore, if other mechanisms are in use by those organizations, the questionnaire did not determine what they are.

Leadership may play a role in the lack of flow chart use by the shore establishment. As mentioned in an earlier paragraph, fear on the part of managers responsible for processes may lead to discouragement of flow chart use. Flow charts are designed to map out processes in a way that focuses on process improvement rather than problem-solving. If managers are being rewarded for problem-solving, there is little incentive to start flow-charting processes! Flow

charts will show the way that processes really work in an organization, which may not be what the leadership wants. The leadership in shore establishment organizations may view flow charts as showing accountability for processes: accountability that may place them as the source of problems or errors. In organizations where performance evaluation focuses on the ability to solve problems, the leaders would prefer to be known as problem solvers...rather than the source of problems.

As the use of flow charts seems to have been successfully implemented in the operating force organizations (all eight organizations surveyed used them), it's likely that there is another explanation for their lack of use in the shore establishment. As mentioned in the previous section, the operating forces may have had the benefit of being used as "demonstration units" for the rest of the fleet; they are in the unique position of being the first to implement the philosophy in the operating forces. It's possible that the "mobile training teams" were influential in starting the operating force units on the use of flow charts, whereas the shore establishment units relied on education from other sources (the TQL schools on both coasts and other seminars) to learn about TQL tools. The education given to TQL practitioners in those operating force units may have emphasized flow chart use.

Unfortunately, none of the questionnaire respondents indicated in the "remarks" sections why they chose not to use flow charts. The only hint as to why they weren't used more often in the shore establishment was found in the remarks by several respondents, who said that their organizations had only begun implementing TQL, and therefore had not started using all of the tools that they would eventually use.

In describing how the shore establishment middle managers generally accepted responsibility for quality and/or productivity performance improvements less than the operating force middle managers, it's important to understand who "middle management" was. As the population sampled generally had similar command structures, it could be safely assumed that "middle management" consisted of the staff non-commissioned officers and company/department head level officers of the sample commands. With a few minor exceptions, petty officers and field grade officers might be included as well.

The raw data showed that of the 8 operating force organization respondents, 7 answered that their middle management accepted responsibility for quality and/or productivity performance improvement. However, only 2 of 8 shore establishment organization respondents answered affirmatively.

A cause-and-effect diagram, displayed in Figure 4, is used to help explain the findings:

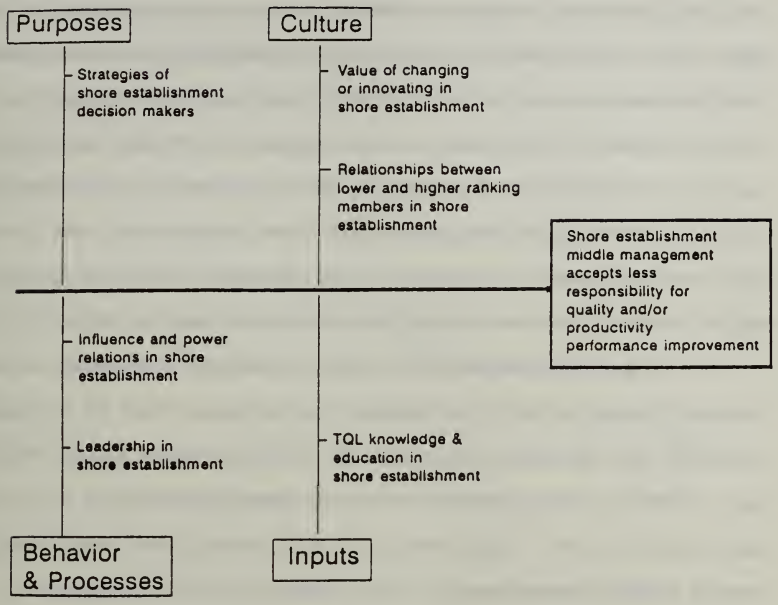
Purposes
Culture
Strategies of shore establishment decision makers
Value of changing or innovating in shore establishment
Relationships between lower and higher ranking members in shore establishment
Shore establishment middle management accepts less responsibility for quality and/or productivity performance improvement
Influence and power relations in shore establishment
Leadership in shore establishment
TQL knowledge & education in shore establishment
Behavior & Processes
Inputs

Figure 4
Cause-and-Effect Diagram
Assessing why shore establishment middle managers accept responsibility less for quality and/or productivity performance improvement than operating force organizations

Harrison's Open System Model provides several reasons that may explain why the shore establishment middle managers show less acceptance of responsibility. One sub-component of "purposes" is "strategy", which refers to the overall routes to goals. It is possible that the TQL implementation strategy of the shore establishment's decision makers has not incorporated the use of Quality

Management Boards (QMBs) to the degree that has occurred in the operating forces. QMBs provide a means for managers to manage processes. If the QMBs are not being stressed as an important component of the quality management process, then middle managers are going to feel left out of the quality effort. One of the biggest challenges for "total quality" during its earlier introduction to American industry was to ensure that middle management had a valid role in the quality management process. It's possible that the shore establishment may be struggling with the same problem.

A poorly defined TQL implementation strategy, or a strategy that is in its infancy, could also lead to unwanted behavior on the part of managers. As was pointed out by Mary Walton, one common mistake by organizations implementing the "total quality" philosophy has been to bypass middle management. As a result of being bypassed, middle managers feel threatened. [Ref. 2:p. 239] As one questionnaire respondent wrote, middle management sees TQL as a threat and is apprehensive to provide total support for its implementation. Another respondent wrote that although TQL was being accepted in theory, the middle and lower levels of the organizations were still not totally trained in TQL and were not sure of what they needed to do.

Another component of Harrison's model that help explain the differences in acceptance of responsibility by the two organization types is "culture". The possibility

exists that even with the changes being instituted by DON (where ESCs, QMBs and PATs are being used to facilitate the quality management process) middle managers are feeling somewhat alienated from the TQL implementation process. TQL will require them to modify their traditional roles and to allow more decision-making at the lower levels of the organization. The DON's TQL planners must, however, be aware that the imposition of the TQL philosophy on the Navy's current management structures is going to cause a re-defining of roles and uncertainty on the part of many of its middle managers. A major part of the challenge, then, is going to be in re-educating middle-level managers of their proper roles and fostering an environment where the ESCs, QMBs and PATs are regarded as an integral part of the organization.

Another subcomponent of "culture" may explain the differences in acceptance of responsibility between the organization types: the value of changing or innovating. Two written responses by shore establishment respondents noted that members of their organization still felt that TQL was just another management technique that was being introduced only to eventually fade away. If the members of an organization, to include its middle managers, felt that TQL is just a fad, then that could account for a lack of interest in being responsible for quality and/or productivity performance improvements.

A close look at the raw data showed that the major cause of the statistically significant differences were the shore establishment organizations with less than one year of exposure to TQL. Of the five respondents in that category, none indicated that middle management accepted responsibility. However, of the three shore establishment organizations with at least one year of TQL exposure, two indicated that their middle management accepted responsibility for quality and/or productivity performance improvements. In a sense, the data is encouraging for DON because it may show that the more middle managers are exposed to TQL, the greater their acceptance of responsibility for quality improvements.

5. Assessing the differences between the operating force and shore establishment organizations surveyed in the use of specific TQL tools and processes - organizations broken down by length of TQL exposure time

The previous section's discussion indicated that the difference in acceptance of responsibility for quality and/or productivity performance improvement between the two organization types (Question 34) seemed to be most influenced by organizations with less than a year of TQL exposure. Dividing the two organization types into two groups based on length of TQL exposure time, we find that

the significant differences between the organizations was limited to organizations with less than one year of exposure to TQL. The significant differences found between the two organization types were in the use of flow charts and in how the organizations' members viewed change, as denoted by the Mann-Whitney test results presented in Table 14. For the sake of brevity, all tools and processes whose use was not statistically significant were omitted.

TABLE 14
MANN-WHITNEY TEST
OPERATING FORCES VS. SHORE ESTABLISHMENT
LESS THAN 1 YEAR EXPOSURE TO TQL
TOOLS AND PROCESSES AS DESCRIBED IN QUESTIONNAIRE

Question #	Test Statistic Significance Level	Significant Difference?
1	< .05	YES
83	< .05	YES

The statistically significant differences in the use of flow charts (question 1) by the two organization types was already discovered and analyzed in section 4. Therefore, the analysis will not be repeated here. However, the Table 14 data results also brought out another significant difference between the organization types that had been exposed to TQL for less than a year. The difference, found in question 83, was in how the organizations' members viewed change. While all of the operating force respondents answered that their organization's members viewed change positively, only 1 of 5

shore establishment respondents indicated the same.

Several respondent comments indicate why members of organizations may not view change positively. One respondent said that the imposition of TQL concepts over a military command structure was the most daunting task for the new philosophy. Another respondent said that fear and skepticism of TQL still existed at the lower levels of the organization. Figure 5 highlights components that may cause the difference in attitudes towards change.

Figure 5 shows that the purposes of the organization's decision makers could affect how change is viewed. In particular, how decision makers articulate the goals of change to TQL could affect how positively the members view change. If the members of the organization understand what the goal of the organization's TQL efforts are, they will be in a position to determine if they value the changes that the organization is making. If the goals of TQL have not been articulated to the members of the organization, a positive view of the change is less likely to exist among the organization's members, as they will not understand how TQL is supposed to help them.

If the members of the organization understand what the end result of the conversion to the TQL philosophy is supposed to be, but do not value the end result, then change will not be viewed positively either. Also, if the members understand the end result of TQL, but do not understand what

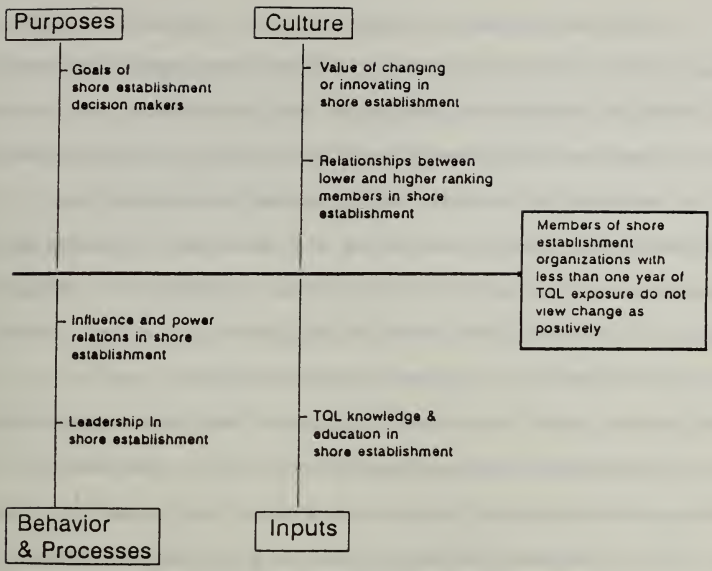
Purposes
Culture
Goals of shore establishment decision makers
Value of changing or innovating in shore establishment
Relationships between lower and higher ranking members in shore establishment
Members of shore establishment organizations with less than one year of TQL exposure do not view change as positively
Influence and power relations in shore establishment
Leadership in shore establishment
TQL knowledge & education in shore establishment
Behavior & Processes
Inputs

Figure 5
Cause-and-Effect Diagram
Assessing why members of shore establishment organizations with less than 1 year of TQL exposure do not view change as positively as operating force organizations.

it will take to get there, they may also be less apt to view change positively, as fear and skepticism may affect their attitude towards the TQL implementation process. It's also possible that change is not as deeply ingrained in the general organizational culture of the shore establishment. If operating force members view change as a normal part of their environment, they may be more accepting of it. On the other hand, shore establishment members may view change as upsetting the balance of their organizations, which could account for fear of change or skepticism of new initiatives.

The leadership of organizations that do not view change positively also play a role in how organizational members view change, as they are responsible for moving their organizations towards a "total quality" environment. If the leadership has not embraced the philosophy or explained the transformation to its members, there would be no reason for the members to be more accepting of change. Also, if the leadership harbors reservations about change, the attitude will likely permeate throughout the organization, and the result could be that the organization generally does not view change positively. As two of Deming's 14 Points of Management state, the organizations must learn the new philosophy and take action to accomplish the transformation to a "total quality" environment. Apparently, the transformation has yet to take hold in the shore establishment organizations with less than a year's exposure to the philosophy. The leadership of those organizations may be a part of the cause.

As with other significant differences found in this study, "knowledge" may be a factor in the shore establishment organizations' lack of a positive view about change. As with other differences found when comparing the organization types, how positively change is viewed may be determined in part by the education that the organizations have received in the area of TQL, and/or by the emphasis being put on the transformation of the operating forces to

the TQL philosophy. The possibility exists that the operating forces are simply viewing change positively at a faster rate than the shore establishment organizations. The raw data found in the questionnaires indicates that the last point may be true. The responses given by the shore establishment organizations with over a year of exposure to TQL seems to indicate that a transformation can occur, as 2 of the 3 organizations queried indicated that their members had a positive attitude toward change. The small sample size (three organizations) puts limitations on the validity of the finding, but nonetheless shows that some shore establishment organizations do view change positively after having been exposed to TQL for at least a year.

B. SUMMARY OF FINDINGS

The report's statistical analysis showed that there were three TQL tools or processes whose use differed significantly between the DON shore establishment and operating forces. One difference, the use of flow charts to determine how processes work, was statistically significant when comparing all operating force organizations against shore establishment organizations and when comparing organization types that had less than one year of TQL exposure. Another difference found was in how middle management accepted responsibility for quality and/or productivity performance improvements. The data showed that

shore establishment middle managers generally did not accept responsibility for performance improvements. Finally, a third difference between the two organization types was found in how shore establishment organizations with less than one year of TQL exposure viewed "change". The data showed that compared to the operating forces, the shore establishment organizational members generally did not view change positively.

The statistical analysis also showed that when comparing organizations with less than a year of TQL exposure, the operating force organizations generally used more TQL tools and processes. However, when the compared organizations had at least a year of TQL exposure, the differences between the two organizations in their use of the TQL tools and processes was negligible.

Harrison's Open System Model was used to help explain why the differences between the two organizations types existed, and the model's components of "culture", "structure", "purposes", "behavior and processes" and "inputs" played key roles in highlighting the differences.

The chapter focused on determining significant differences between the operating force and shore establishment organizations. Therefore, the fact that the organizations showed no statistically significant differences in 101 out of 104 tools and process categories was downplayed. This important fact shows that the

similarities in the conduct of TQL by the organizations, as defined by the parameters of the questionnaire, greatly outnumber the differences. Chapter V will discuss the implications of the statistical test findings and make recommendations based on those findings.

V. CONCLUSIONS AND RECOMMENDATIONS

The conclusions and recommendations that follow are limited and constrained by the following factors:

- the findings in this thesis are based on the results of a survey administered to 16 DON organizations. Therefore, the sample size used was relatively small, which places qualifications on the validity of any conclusions made.

- the survey used was only one of many possible instruments that could have been used to evaluate differences in the conduct of TQL by the organizations: other survey methods could have uncovered other differences or refuted findings made in this study.

- the assessed organizations had between one and 22 months of TQL exposure time. Therefore, the conclusions and recommendations are based on findings that may lose their validity when assessing organizations that have more TQL exposure time than those used in this study.

- operating force units that implement the TQL tools and processes in the future will be functioning under new pressures caused by the changing socio-political environment of the DON. For example, the operating force units that start implementing TQL in the future may not get the senior leadership's attention that current "demonstration units" may be receiving. Therefore, the findings in this thesis may not be duplicated with future operating force organizations implementing TQL, and the conclusions and recommendations made in this study may not be valid in the not-too-distant future.

A. CONCLUSIONS

If this thesis's results were to be used as a barometer of where the DON operating forces and shore establishment stand in relation to each other in the conduct

of TQL, the conclusion would be that they are very similar. When comparing the two organization types without classifying them by length of TQL exposure time, we find there is no statistically significant difference in the way the DON operating forces and shore establishment conduct TQL. We can also answer the secondary research question by saying that when comparing the two organization types without classifying them by their length of TQL exposure time, we find no significant differences in their use of TQL tools and processes.

However, when we compare the two organization types based on their length of TQL exposure time, differences in their overall conduct, use of TQL tools, and use of TQL processes emerge:

- Shore establishment organizations did not use flow charts as much as the operating force organizations, particularly when those organizations had less than one year of TQL exposure.

- Shore establishment organizational members did not accept responsibility for quality and/or productivity performance improvements as much as the operating force managers did. This difference was limited to organizations with less than one year of TQL exposure.

- Shore establishment organizational members did not view "change" as positively as operating force organizational members. Again, this difference was limited to organizations with less than one year of TQL exposure.

Other major findings that came from the descriptive statistics used in this thesis were that:

- the operating forces with less than one year of TQL exposure generally used more TQL tools and processes

than the shore establishment organizations with less than a year of TQL exposure.

- the operating force and shore establishment with at least a year of TQL exposure generally used the same amount of TQL tools and processes.

The analysis of the differences found throughout the research were analyzed using Harrison's Open System Model of organizations. The major conclusions that resulted from the analysis of the differences were:

- the shore establishment organization members did not view change positively as quickly as the operating force organization members. The possibility exists that the operating forces culture, which often stresses change as a part of the environment, may allow for earlier acceptance of change, and that shore establishment members tend to view change more as upsetting the balance in the organization.

- the "interests" of the operating force organization dominant decision makers may explain why the operating forces are implementing TQL tools and processes at a faster rate than the shore establishment. The operating force organizations' dominant decision makers may feel that they are under closer scrutiny by the Navy's top leadership, as their TQL implementation efforts have only recently begun. Therefore, they may be placing more emphasis than the shore establishment on ensuring that the TQL tools and processes are implemented fully and expeditiously.

- the differences between the organization types in this study could be related to the emphasis that their leadership has placed on transforming the organization to the TQL philosophy. How well the transformation was occurring could also have been affected by how middle managers felt about TQL. If the middle managers in the shore establishment organizations perceived TQL as a threat, it could affect their organization's overall acceptance of the philosophy.

- TQL education has come from a variety of sources, but the operating force organizations are the first of their kind to be implementing the TQL philosophy. The receipt of consistent, well-developed TQL training by mobile training teams may account in part for the differences

in the organizations' depth of TQL tool and process use in the first year of TQL exposure, and in the way that TQL is viewed or accepted in those organizations.

To keep the findings on differences between the two organization types in proper perspective, however, one must note that the similarities in the amount and type of TQL tools and processes used by the operating force and shore establishment organizations far outnumbered the differences.

B. RECOMMENDATIONS

As mentioned in Chapter I, this thesis did not set out to judge the relative worth of any particular TQL implementation approach, but only to determine if there where differences. The following recommendations are made so that TQL planners, educators, and coordinators are made more aware of what they may chose to do if they want to narrow the gap in the differences in the conduct of TQL in shore establishment and operating force organizations:

- The leaders and TQL planners of shore establishment organizations must strive to ensure that their organizations' members understand what must occur in their organization' transformation to the TQL philosophy. They must take the necessary steps to accomplish the transformation by ensuring that middle managers have a voice and role in the transformation. Additionally, shore establishment leaders must ensure that their organizations' purposes are compatible with TQL philosophy, or they will find it difficult to truly accomplish the transformation.

- DON TQL planners and educators must assess the TQL education effort in the Navy to determine if and where inconsistencies may exist. This study's results should encourage planners and educators to find out where the DON TQL education effort is most effective and where

improvements are needed. Although it may be impossible or even unneeded to stress uniformity in the TQL education process throughout the Navy, this study should serve as an indicator that variations in the TQL education effort may result in variations in the conduct of TQL in DON organizations. Granted, the initial TQL education of Navy members is only one of many variables that affect how they implement TQL in their organizations, but as the initial step in the organizations' journey to the "total quality" environment, its importance should not be discounted.

No radical changes have been proposed for DON's TQL implementation process. The reason is obvious: based on the statistical testing of the research questions for this thesis, indications are that the shore establishment and operating force organizations are generally at similar places along the same path in their conduct of TQL.

C. SUGGESTIONS FOR FURTHER RESEARCH

This thesis should be replicated as often as desired to assess the state of TQL in the DON operating forces and shore establishment. Replication of this study would allow TQL planners and educators to determine if the use of TQL tools and processes is increasing in DON organizations and if additional differences may develop between the two organization types. The questionnaires used in further testing should be modified to include questions that assess the state of the organization's quality-management structure (ESCs, QMBs and PATs). Additionally, the studies should include a larger number of organizations, and the categories under which the organizations are assessed should be changed

to reflect the DON's increased exposure time to TQL (for example, comparing organizations with more or less than one, two and four years of TQL exposure). Given the recency of TQL implementation in the DON (particularly in the operating forces) the results of further study will lead to more definitive conclusions about the conduct of TQL in the two organization types.

Studies in the area of TQL effectiveness should also be undertaken. While this study presented a snapshot of what is occurring with TQL in DON organizations, other studies could take a more judgmental approach by determining what is actually working or not working with TQL in DON, and using notable organizations as examples of success or failure in DON's movement to a "total quality" force.

APPENDIX A

10 Sep 1992

From: Capt. Philip G. Rynn, USMC, 098-54-6137/2502,
SMC Box 1806, Naval Postgraduate School, Monterey CA
93940

To:

Subj: Thesis Assistance; Request for

Encl: (1) Questionnaire

1. Enclosure (1) is the primary means of data collection for a thesis in the Defense Systems Analysis curriculum at the Naval Postgraduate School, Monterey, CA. The thesis assesses the differences, if any, in the conduct of Total Quality Leadership in shore establishment and operating force organizations in the Department of the Navy. The results of the study may be useful to TQL planners, coordinators and educators in assessing the current state of TQL in DON by learning what tools of TQL are being used and how TQL affects the policies, practices and procedures in both types of organizations.

2. As the TQL coordinator for your command, you are in a good position to provide a sound assessment of the current state of TQL in your organization. The questionnaire attempts to catalog the conduct of TQL in your organization by determining how your organization uses quality control tools, and how your organization's policies, practices, and procedures reflect "total quality" practices. There are no "right" or "wrong" answers in this questionnaire. In order to allow you to maintain your objectivity as best as possible when filling out this questionnnaire, please leave your name or your organization's name/address off of the questionnaire. I am not interested in knowing what is reported by any particular organization, but I am interested in developing an accurate analysis which will stand up to statistical analysis and which will be a more accurate barometer of the current state of TQL in DON. I appreciate your best effort to present an accurate picture of what your organization does or does not do in its "total quality" environment, and I will state again that the thesis will not report the results or comments of any organization, but will use the questionnaire results to assess differences in the conduct of TQL in shore establishment and operating force organizations.

3. Due to the lengthy nature of the questionnaire tabulation process, a relatively quick response time is necessary. Therefore, please complete and return the questionnaire by 2 October 1992 in the envelope provided. If for any reason you should receive this questionnaire after that date, please complete and send it anyway, as I will make every effort possible to include your command's questionnaire results into the thesis.

4. As a courtesy to you, and with appreciation for taking the time to fill out the questionnaire, a copy of my thesis will be mailed to you when it is completed. I have already put your command (with your office as the destination) on my thesis mailing list. Hopefully, it will be a good addition to your TQL readings library, and it may prove useful in mapping out the future directions for TQL in your organization.

Very Respectfully,

Philip G. Rynn
CAPT USMC

INSTRUCTIONS FOR COMPLETING QUESTIONNAIRE:

1. This questionnaire examines the tools and processes of TQL in your organization. "Tools" refers to the specific techniques used to promote quality and/or productivity improvements throughout your organization, and "processes" refers to your organization's policies, practices and procedures.

2. The questionnaire consists of 104 questions, each with a simple "yes" or "no" answer option. Determine if the statement, as it applies to your organization, requires a "yes" or "no" answer, and circle the appropriate answer. You will find space to make additional comments throughout the questionnaire. Use the space to comment on the questions that precede it. Feel free to comment on anything: how the question may not apply to your organization, how you may have made certain assumptions in answering the question, how the question may only touch on a more important, but unexamined issue. In short, use the space to "flesh out" the questionnaire. The personal touch that you provide will certainly help me determine the validity and applicability of the research results, and it may uncover other trends that the questionnaire may have failed to account for.

3. Please answer all of the questions. They will be tabulated for use in a statistical assessment, and the accuracy of the analysis can only be assured by tabulating fully completed questionnaires.

4. Use the glossary which follows this page to understand terms that may be vague. If you do not understand words that are not included in the glossary, indicate so in the "Comment" spaces where appropriate.

5. Once you have completed the questionnaire, use the envelope provided to return it.

6. Indicate the approximate year and month that your organization started implementation of Total Quality Leadership:

_____

7. Indicate your organization type: ____ Operating forces

____ Shore Establishment

8. Please return this page with your questionnaire.

GLOSSARY

Work Unit - A section, department, or sub-unit of the organization being assessed.

Top Level/Higher Level - refers to leadership above that of the most senior leaders in the organization.

Critical Mass - organizational members that have been exposed to the teachings and principles of Dr. Deming and that are numerous enough to ensure that the organization will move forward with the exercise of Total Quality Management/Total Quality Leadership.

Operating Forces - the four fleets, sea-going forces, district forces, Fleet Marine Forces, the Military Sealift Command, and such shore activities of the Navy and other forces as may be assigned by the President or Secretary of the Navy.

Shore Establishment - the field activities of DON, except shore activities assigned to the Operating Forces of the Navy.

This organization:

1. uses flow charts to determine how processes work	YES	NO
2. uses cause-and-effect diagrams to highlight causes of problems	YES	NO
3. uses affinity diagrams to help understand the structure of problems	YES	NO
4. uses check sheets to collect data for analysis	YES	NO
5. uses Pareto charts to highlight potential causes of problems	YES	NO
6. uses histograms to assess data that is in a state of statistical control	YES	NO
7. uses scatter diagrams to examine possible relationships between data	YES	NO
8. uses run charts to look for trends	YES	NO
9. uses control charts to analyze processes	YES	NO
10. uses control charts to monitor processes	YES	NO
11. uses tree diagrams to map out the full range of paths and tasks needed to be accomplished to achieve primary goals	YES	NO
12. uses prioritization matrices to narrow down options to those that are most desirable	YES	NO

Comments:

13. This organization has a strategic business plan YES NO

This organization has a quality and/or productivity improvement policy that:

14. is written YES NO

15. has specific goals and objectives YES NO

16. everyone in the organization has seen YES NO

17. is taken seriously by people YES NO

Comments:

_____

_____

_____

_____

The leaders at the top level in this organization:

18. have agreed upon a definition of quality and/or productivity improvement YES NO

19. have set long-term goals concerning quality and/or productivity improvements YES NO

20. have set short-term objectives concerning quality and/or productivity improvements YES NO

21. have defined performance measures to monitor progress toward reaching objectives and goals YES NO

Comments:

_____

_____

_____

_____

_____

_____

_____

The majority of work units within this organization:

22. know how the organization defines quality and/or productivity improvement YES NO

23. have set long-term goals concerning quality and/or productivity improvement YES NO

24. have set short-term objectives concerning quality and/or productivity improvement YES NO

25. have defined performance measures to monitor progress toward reaching their objectives and goals YES NO

The majority of organizational members:

26. can specify, if asked, what goals or objectives they are working toward YES NO

27. were invited to participate in setting goals or objectives related to their work YES NO

28. know how the goals/objectives they are working toward relate to their work unit's mission YES NO

Comments:

_____

_____

_____

_____

29. The commanding officer has attended a TQL seminar/course YES NO

30. The "critical mass" of organizational members have attended a TQL seminar or course YES NO

31. The organization has formally defined its customers and their needs YES NO

32. Deming's Fourteen Points are often discussed at all levels of the organization YES NO

Comments:

_____

_____

_____

Responsibility for quality and/or productivity performance improvement:

33. is accepted by senior management YES NO

34. is accepted by middle management YES NO

35. is accepted by organizational members YES NO

Comments:

_____

_____

_____

_____

36. This organization has taken steps to use sampling, as opposed to 100% inspection YES NO

37. This organization has taken steps to move the emphasis of inspections towards quality improvement and away from compliance YES NO

Comments:

_____

_____

_____

_____

This organization:

38. uses other criteria besides price when making purchase decisions YES NO

39. actively involves its suppliers in the quality improvement process YES NO

Comments:

_____

_____

_____

_____

40. has a separately identified unit or office which oversees its quality and/or productivity improvement process YES NO

41. used formal interviews with some/all of its members in order to determine what improvements in quality and/or productivity are needed YES NO

42. informally asked some/all of its members for their opinions about what improvements in quality and/or productivity are needed YES NO

43. asked quality improvement team members to report periodically YES NO

44. has called groups of individuals together to define performance measures to track progress toward goal attainment YES NO

45. has used surveys of some/all of its members in order to determine what improvements in quality and/or productivity are needed YES NO

46. has considered or evaluated acquiring recent technological improvements (equipment, materials) YES NO

47. has a realistic schedule for replacing outdated equipment YES NO

48. has the necessary expertise, either in-house or through known outside contacts, to use statistics for process analysis YES NO

49. has instituted use of the PDCA (Plan, Do, Check, Act) Cycle to improve processes YES NO

50. has a data base or tracking system for relevant quality and/or productivity improvement information YES NO

Comments:

The performance data this organization collects:

51. are used to identify problems/barriers YES NO

52. are evaluated by improvement teams (ESC,QMB) YES NO

53. are used to identify opportunities for quality and/or productivity improvement YES NO

Comments:

_____

_____

_____

_____

This organization:

54. trains its personnel through in-house training programs and outside education/seminars before assigning them to their primary job YES NO

55. has arranged workshops to promote quality and/or productivity awareness among its members YES NO

56. is currently training its members in statistical process control YES NO

57. is currently training its members in variation YES NO

58. has a supervisor development program that trains supervisors in their jobs, and includes a full understanding of the work done by their subordinates YES NO

Comments:

_____

_____

_____

_____

59. The primary task of leaders in this organization is to improve processes and prevent problems YES NO

60. Managers at all levels have clearly defined roles in our quality and/or productivity improvement process YES NO

Leaders in this organization:

61. study the system of causes and act on the causes YES NO

62. do not judge people on results which are the combined effects of the interaction of the system and the people YES NO

63. study processes in order to remove or reduce barriers which prevent people from doing (and taking pride in) quality work YES NO

64. work with employees to improve the process YES NO

65. are empowered to inform higher-level management of conditions that need correction YES NO

66. understand that roughly half of any set of results will be below the average result, and use that knowledge when making decisions or acting on information YES NO

67. recognize that performance is the result of the combination of individual effort, effect of the larger system and interaction of the two YES NO

68. understand the difference between common causes and special causes of variation YES NO

69. use their understanding of variation when evaluating subordinates' performance YES NO

70. maintain primary responsibility for seeing that his/her employees are trained YES NO

71. view "change" positively YES NO

72. control processes rather than outcomes YES NO

73. welcome suggestions from their workers YES NO

74. <u>do not</u> view their reporting senior/supervisor as their most important customer YES NO

75. have an active "follow me" mentality showing that he/she accepts responsibility for risks YES NO

Comments:

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_____

76. Creative thinking is rewarded in this organization YES NO

77. Taking risks is rewarded in this organization YES NO

78. Managers at all levels have the authority to try a promising new approach YES NO

79. A promising new approach is likely to be approved quickly for trial YES NO

Members of this organization:

80. are not afraid of losing their jobs/careers due to TQL YES NO

81. are not afraid to ask "dumb questions" YES NO

82. are not suspicious (or skeptical) about its senior leaders YES NO

83. view "change" positively YES NO

84. do not view their reporting senior/supervisor as their most important customer YES NO

Comments:

85. Organizational members have the information they need from other departments to do their work YES NO

86. Organizational members do not follow narrow functional interests YES NO

This organization has:

87. established quality improvement teams (groups of individuals who come together to solve quality-related problems) YES NO

88. called groups of individuals together to define or clarify the organization's and work units' quality improvement mission YES NO

89. called groups of individuals together to define long-term organizational quality improvement goals and/or long-term work unit quality improvement goals YES NO

90. called groups of individuals together to define short-term organizational objectives and/or short-term work unit objectives YES NO

91. This organization uses cross-departmental teams to manage critical processes YES NO

Comments:

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92. This organization has taken steps to reduce or de-emphasize the use of slogans in the workplace YES NO

93. Numerical goals are established for a system in this organization only after that system is in statistical control and system capability has been established YES NO

94. Work standards in this organization are reviewed on a regular basis to determine their applicability and to eliminate them when they are deemed to be a hindrance to quality YES NO

95. This organization has eliminated MBO (management by objectives) and other work standards for managers/supervisors YES NO

Comments:

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96. Members of the organization have been surveyed to identify barriers to continuing improvement YES NO

97. This organization has called groups of individuals together to identify obstacles to quality improvement YES NO

98. The performance appraisals of leaders at all levels include quality and/or productivity improvement criteria YES NO

99. The performance appraisals of organizational members include quality and/or productivity improvement criteria YES NO

Organizational members with good ideas are likely to:

100. formally submit them through a suggestion system YES NO

101. tell their supervisors YES NO

102. be asked periodically what they think YES NO

Comments:

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This organization:

103. has a quality and/or productivity resource library YES NO

104. This organization has a long-range education plan for continuously improving the ability of its people YES NO

Comments:

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Please ensure that you have indicated your organization type on the questionnaire instructions page.

Use the pre-addressed envelope to return the questionnaire. If you need to return the questionnaire in another envelope, use the following mailing address:

Capt. Philip G. Rynn
SMC 1806, NPS
Monterey, CA 93943-5000

If you want to discuss any part of the thesis with me, feel free to call me at (408) 372-3605. If I'm not home, just leave a message and I will return your call.

THANK YOU FOR YOUR TIME AND HELP IN BEING A PART OF THIS THESIS!

APPENDIX B

This appendix shows how the questions used in this thesis's survey were matched to Deming's "14 Points of Management" to determine how the compared organizations used the TQL philosophy.

Deming's Point of Management	Question#
Point 1 - Create and publish to all employees a statement of the aims and purposes of the company or other organization.	13-28
Point 2 - Learn the new philosophy, top management and everybody.	29-35
Point 3 - Understand the purpose of inspection, for improvement of processes and reduction of cost.	36-37
Point 4 - End the practice of awarding business on price tag alone.	38-39
Point 5 - Improve constantly and forever the system of production and service.	40-53
Point 6 - Institute training (for skills).	54-58
Point 7 - Teach and institute leadership.	59-75
Point 8 - Drive out fear. Create trust. Create a climate for innovation.	76-84
Point 9 - Optimize toward the aims and purposes of the company, the efforts of teams, groups, staff areas, too.	85-91
Point 10 - Eliminate slogans, exhortations, and targets for the workforce.	92
Point 11 - (a) Eliminate numerical quotas for production. Instead, learn and institute methods for improvement.	93-95
(b) Eliminate M.B.O. (Management By Objective) Instead, learn the capabilities of processes, and how to improve them.	

Point 12 - Remove barriers to pride of workmanship	96-102
Point 13 - Institute a vigorous program of education and retraining.	103-104

The survey's questions were not matched to Point 14 of Deming's Points: "Take Action to accomplish the transformation", as the survey was designed to measure how the assessed organizations were accomplishing the transformation through the use of TQL tools, and processes related to the first 13 Points.

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